

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY—BULLETIN NO. 68.

D. E. SALMON, D. V. M., Chief of Bureau.

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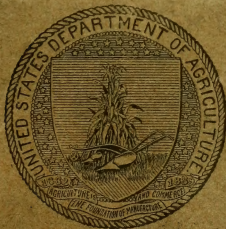
CONCERNING

THE MILCH GOATS.

BY

GEORGE FAY, FTE THOMPSON, M. S.,

Editor of Bureau of Animal Industry.



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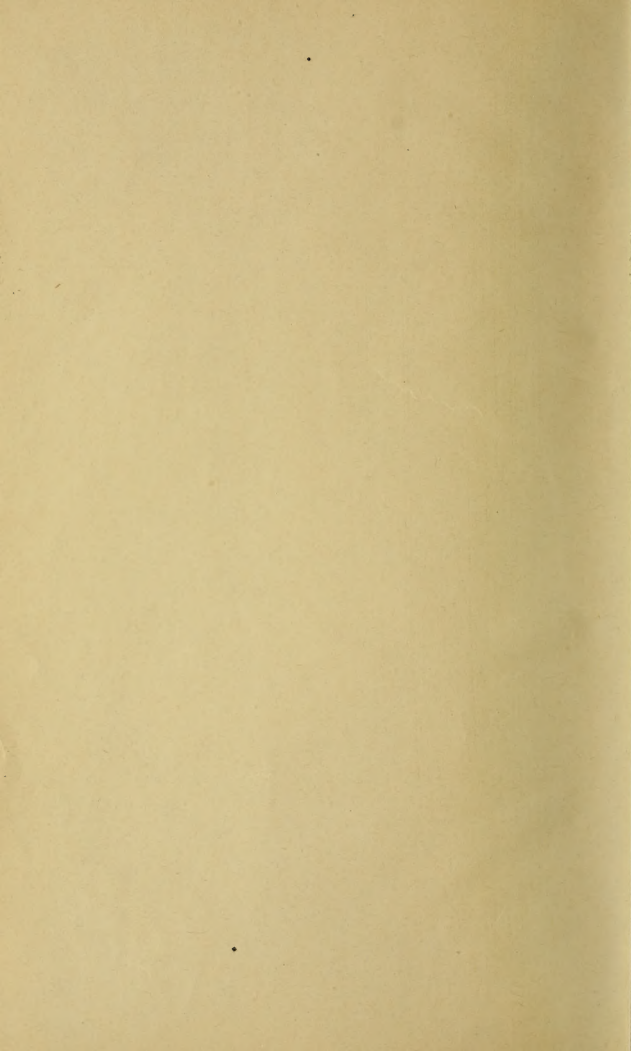
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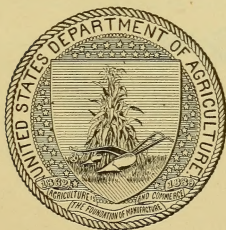
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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., January 4, 1905.

SIR: I have the honor to transmit herewith a manuscript entitled "Information concerning the milch goats," by George Fayette Thompson, M. S., editor of this Bureau. Since the publication by this Department of bulletins on the subject of Angora goats, there has developed an interest in milch goats which has increased to almost a public demand for a publication on that subject; and the manuscript transmitted herewith is designed to answer the questions that have been received by this Bureau touching the various phases of a milch goat industry. The author makes no pretense of embodying personal experiences in this paper, but has given the facts and opinions as they have been gleaned from European writers on the subject; but he believes that the statements contained in this paper are the more valuable because of having been measured by the general rules that govern the raising of Angora goats and sheep.

Acknowledgments are cheerfully made of the assistance received from owners of milch goats who have furnished information and photographs.

I recommend that this manuscript be published as Bulletin No. 68 of the Bureau of Animal Industry series.

Respectfully,

D. E. SALMON,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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INFORMATION CONCERNING THE MILCH GOATS.

By GEORGE FAYETTE THOMPSON, M. S.,
Editor of the Bureau of Animal Industry.

SOME PRELIMINARY REMARKS.

In these days the American people are not only willing but anxious apparently to take up the work of any line of inquiry or experimentation that will add in any particular to the wealth or happiness of mankind. Mere sentiment exerts but little influence in such matters. "Will it pay?" is the chief question concerning any new proposition, whether it be the establishment of an animal industry, a factory, or a college, and the permanency of the thing proposed depends upon an affirmative answer to this question. So it is that such specialties as the raising of chickens, ducks, geese, ostriches, frogs, etc., on a large scale have been established.

Notwithstanding the above facts, all special industries like those named are beset with ridicule to some extent and are thus oftentimes unmistakably hindered in their progress. Those who have become interested in goats have expected more of such ridicule than they have actually received, and it can now be said that everybody is the friend of the Angora. Probably the highest compliment that was paid to the author's bulletin on the Angora goat was by one of the celebrated papers devoted to humor, in these words: "The only funny thing about the book is that the author treats the subject seriously." The author could wish for no higher compliment for this work on milch goats. The goat has been the friend of man from the beginning and it can not be spared now without creating a deficiency in the sum of human comfort and happiness.

Since it has become evident that the Angora goat industry is quite securely established throughout the country generally, many people have very naturally begun to consider the possibilities of another industry, which in some respects is closely allied to it, namely, the milch goat industry; and the Bureau of Animal Industry has found it necessary to gather a large amount of data in order to answer the numerous questions that it has received concerning every phase of milch goat management. These requests have come mainly from two

classes of our citizens—those who were reared in foreign countries where goat's milk was very largely or solely used and those who have read of the economy of goat keeping and the reported value of the milk for children and sick people. The second class includes many physicians who, believing in the hygienic virtues of goat's milk, would like to see goat dairies established in the neighborhood of all large cities, so that a constant supply of the milk might be available at all times.

Milch goats are a prominent feature of the live stock industry of Europe, especially in Switzerland, Italy, Germany, Austria, France, Norway, and Spain. They are peculiarly adapted to the needs of the poorer classes of those countries, and, to a large extent, it is this adaptability that recommends them for many localities in the United States. This is so because milk, which is food and drink to all mankind, is furnished by the goat in cheap form, because for most purposes its quality is superior to cow's milk, and also because the yield of milk, when size of animal and amount of feed are concerned, is much greater than that of a cow.

The number of goats in the world could be only roughly estimated, and to say how many milch goats there are among them would be but a guess. German writers on milch goats have estimated that there were about 3,000,000 goats in the German Empire in 1892. As there was an increase shown for every decade from 1873, it is probable that the number is considerably augmented at the present time.

Dettweiler (1892) gives some statistics regarding the milch goat industry of Germany which are interesting. His estimate of the annual value of the goat business is as follows:

Goats and goat products in Germany, 1892.

Value of goats.....	50, 000, 000 marks (\$11, 900, 000)
Value of milk produced.....	150, 000, 000 marks (35, 700, 000)
Value of kids slaughtered.....	7, 500, 000 marks (1, 785, 000)
Value of goats slaughtered.....	6, 500, 000 marks (1, 547, 000)
Total	214, 000, 000 marks (50, 932, 000)

It therefore appears that the milch goat industry of Germany is worth annually about \$39,000,000, after the value of foundation flocks is deducted. It is indeed a business of no small importance, and for the whole of Europe the total value must certainly reach enormous proportions.

It is officially stated that the production of goat's milk in Switzerland in 1901 was 19,875,000 gallons. At an estimated value of 10 cents per quart, this equals nearly \$8,000,000. The number of goats there of both sexes and of all ages for that year was 354,534, which was 135,000 more than the number of sheep. Although Switzerland

is peculiarly adapted to goat raising, we should remember in making comparisons and estimates that her total area is about 16,000 square miles only, and that much of it is in mountain tops entirely unavailable for any use. Indiana is more than twice as large as Switzerland, and Texas has an area more than sixteen times as great. All this shows that the goat business of that little Republic is of considerable importance, yet most cyclopedias and gazetteers mention it in a word only or not at all.

PRESENT SITUATION.

The present situation regarding a milch goat industry in the United States is confined largely to an awakening interest, although there are now some communities of foreigners where a considerable number of goats are kept for milk, the kids being fitted for slaughter. This is specially true of Italian colonies. Besides, correspondence of this Bureau has brought to light the fact that occasionally in isolated places the common American goat has for some time been kept in very small numbers for milk production. The matter has been given no publicity, yet the goats have apparently fulfilled all expectations. For instance, A. M. Evans, Lonaconing, Md., mentions a few goats in his possession which, when first in milk, yield 2 quarts each per day. The foundation of his flock was gathered together in Allegany County several years ago by a gentleman upon the advice of a physician who recommended the use of goat's milk for an invalid in the family. The goats increased in number and became quite well known in that county, but they were attacked by ridicule, which proved almost fatal to the enterprise, and very few animals remain at this time. In another recent letter of inquiry about sheep in New Jersey, the facts came to light that there are about 500 goats kept by the Italian colony at Palisades Park, N. J., and that a good revenue is derived from the milk, butter, and kids. In all probability we shall hear of several other such instances, especially in the Southern States, where there may be a few goats only in a place.

In discussing the situation as it is at this time, it seems proper to mention here the efforts made by Mrs. Edward Roby, of Chicago, to bring together as many as possible of the best American milkers and to establish a flock that shall transmit the milk characteristics to their progeny; in short, she is seeking to develop an American milch goat. Her purpose is philanthropic, and is carried out by furnishing these goats at low rates and on easy terms, if necessary, to the heads of such households as are most in need of them, in order that the children may be better nourished and be relieved largely from the danger of disease that lurks in much of the cow's milk that finds its way to such households. Persons living in the suburbs who obtain one or two of these goats usually have a lot large enough for the animals and can

provide feed for them. This should insure more and better milk than that from cows which they have been in the habit of using, and they are at the same time enabled to save a considerable sum on the grocery bill.

Mention will be made elsewhere of the purebred milch goats that have been imported into the United States. These purebred animals are all from Switzerland and, with one exception, were imported in April, 1904. They are located in Ohio, Maryland, New Jersey, New York, and Massachusetts, but it will be several years before their influence is widely felt.

ECONOMY OF GOAT KEEPING.

So far as we can apply the leading features of the milch goat industry of Europe to the conditions prevailing in the United States, it can be said that the goat is needed by the poor man who can not afford to keep a cow, and by those people especially who live in the suburbs of the large cities and those who work in the mining districts. Dairies should also be conducted according to approved modern methods, so that a constant supply of milk may be had for sick people and for children whose mothers do not properly nourish them. These are matters of such importance that German writers, referring to the industry in their own country, say that the milch goat in its later development has done great service to the state, in that it supplies a want which before caused great unrest among the peasantry.

In Germany the goat plays the part in the households of poorer people, especially of the day laborers, that the cow does in the households of the well-to-do classes. Hoffmann says that the proportion of households in Germany that keep goats is 75 per cent, and that the keeping is not confined to the poorer people, but that the prosperous middle classes consider the goat of advantage to them also.

It furnishes to its owner, without doubt, the best milk for nourishing infants, for the household, for the cooking of food, and for coffee, besides butter and cheese. When one considers that it very often depends solely on the milk production of the goat whether the nutrition of the child and the whole family is bad or good, and the nutrition from infancy on has a bearing on the ability to perform a greater or a comparatively small amount of work in later life, then one will believe me when I say that the goat is in a position to wield a great influence in sustaining life.—*Dettinger*.

Petersen, with the peasantry of Germany in mind, sums up the worth of the goat in this manner:

(1) The possibility of procuring a goat is generally within the reach of the poorest families; (2) the risk and the insurance premium are disproportionately much less in the case of the goat; (3) the goat utilizes its food better than the cow, and gives considerably more milk in proportion to its body weight; (4) the goat is satisfied with little feed, and with feed of any sort, which is to be had at much less cost; (5) by keeping two goats instead of a cow, the family of the workingman may be provided

during the entire year with milk by the proper regulation of the time of the birth of the kid; (6) the goat gives a more wholesome milk than the cow and the milk is richer in fats.

As to the question of human nourishment, the goat occupies an important position. It yields a wholesome nourishment for the family, serves as a useful and agreeable occupation for wife and children, and awakens in its owner a desire for industry and a spirit of frugality. So long as the workingman is happy in the possession of a business, has a small bit of ground to call his own, and has a profitable domestic animal, just so long will he be an opponent of social strife; a careful provider for his family, and an adherent of some recognized creed.—*Hilpert*.

In Saxony the goat plays an important rôle as the source of the milk of the household; likewise that the homes that are here under consideration belong to that class of people who are without much means. Especially in the industrial districts of the mountains, with a preponderance of the smaller manufactories, the goat is the supporter of the family—in a broad sense, of the people among which it finds its manifold uses. In this way it comes about that goat's milk is such a universally established food material, and one of which the people have become so fond, that they will pay the same price (or in many places even a pfennig higher price) for it than for cow's milk, which latter serves to help out when there is a scarcity of goat's milk. The reason for this may be found in the higher nutritive value of goat's milk, and the assertion is often made here that anyone who has become accustomed to the use of goat's milk for coffee feels it a degradation if he is compelled to be content with cow's milk in its stead, which is not so pleasant to the taste and is poorer in fat than goat's milk. But the goat is beginning to rise in prominence and gain in numbers in highly developed thickly settled districts where the people are more prosperous.—*Dettweiler*.

"We had a terrible season last year and most of us lost heavily in sheep, but the goats kept us going on their milk all the time; and it was in that dry time that I overcame my prejudice and ate and relished goat meat, or, as you would call it, venison. The goats served us well until the rains came. I have just asked my girls about the flock, and they tell me they milk eighteen nannies and make from 4 to 5 pounds of butter weekly from them and have, besides, an abundance of milk for our household of seven and a hired man.—*J. R. Chisholm, Queensland, Australia*.

Such remarks as the above might be copied by the score from foreign books and journals, but those given are sufficient to show the conditions under which the goats are kept and that some of those conditions obtain in the United States and are responsible for the growing interest in milch goats. It will no doubt occur with this new industry, as it has occurred with others at the beginning, that many will enter it who will become overenthusiastic from a little success, while others, expecting much, will condemn all because of a little success only. Neither of these classes will be helpful to the industry. If a milch goat industry is to succeed in this country, it must be upon rational lines.

CLIMATE AND SOIL.

The climate suitable for milch goats is as varied as the breeds of the animals themselves. It would not be safe, in the absence of actual experience, to say that the long-haired goats are best suited to the colder climates and the short-haired ones suitable for the warmer climates only; for in Switzerland, Germany, France, Italy, Spain, and

Malta there are found both kinds, while in Syria, where there are extremes of temperature (from almost perpetual snow on Mount Hermon to tropical heat at Joppa and the Dead Sea), the goats are of the long-haired variety. The goats of Egypt, too, are long haired.

However, notwithstanding the above facts, experience with goats in the United States shows that the short-haired variety will suffer with cold if no protection is provided. The long-haired ones in the cold climates of the Northern States are almost entirely of the Angora breed, and these appear to thrive better in such climates than in the warmer climates of the South. Practically all of our long-haired goats not of the Angora breed are in the Southwest, where the climate is usually very warm, having sometime come over the border line from Mexico. So we find short-haired goats in the North, where the climate in winter is unpropitious, and long-haired ones in the South, where the long hair is not necessary to protect them from the cold.

In all probability it will be found by experience that the long-haired milch goats will thrive in all parts of the United States if proper care is given them, and that most of the short-haired varieties will also do as well; but the matter of care is of prime importance, and goats should receive the same rational treatment that dairy cows get.

All goats are alike in their aversion for cold rains and sleet storms, which are detrimental in large degree, and these conditions, where they recur often, must be considered as drawbacks. Goats do not like rain at any time, but in the warm season they are not injured by it.

The ideal locality for goats is one that is high and rocky, with an abundance of vegetation upon which they may graze and browse, but such a high location is not essential. If the air is quite dry, this makes it all the better. The animals do well on level land, provided it is not swampy and is well drained. Soil composed principally of stiff clay, so that the surface water can not rapidly percolate away, should be avoided as an exclusive pasture for goats. However, if the animals can have access to such land with a free run to higher and drier soil, it will not prove altogether objectionable. They will feed largely upon the wet land, but will seek the higher parts for rest and to sleep at night. If given such a pasture their feet should frequently be examined for evidences of foot-rot. Wet soil is more conducive to a rapid growth of the hoofs, which should be kept trimmed. This trimming is done by natural methods where the goats have access to pastures containing rocks and gravel.

A CONSIDERATION OF THE MILK.

Foreign writers almost unanimously agree in their claims as to the value of goat's milk for invalids, for children, and for cookery. Some of them regard it as most beneficial when taken medicinally for certain diseases and ailments. The claim is generally made that it is absolutely

free at all times from the germs of tuberculosis; but this is a matter which will be discussed under another head, since it concerns the animal itself as well as the milk.

There is a considerable number of sanitariums in France and Switzerland where goat's milk is advertised as a prominent feature of treatment. In these places this milk is the principal kind used in the cooking, and the patients are encouraged to drink as much of it raw as they can. The reports that come from such institutions are very flattering to the medicinal worth of goat's milk, yet, in order that too much reliance may not be placed upon this milk generally, it should be remembered that the animals in those mountainous localities must themselves surely be in most excellent health, having, as they do, the purest of air, feed, and water; and the patients, too, are no doubt greatly benefited by the same pure air and water.

The milk is specially recommended for infants because of its similarity in composition to the mother's milk; and the literature is full of instances of success attending the use of the milk with children that, previous to its use, were rapidly wasting away. The writer has in mind several specific instances of the same character which have occurred in the United States. The *Milch-Zeitung* says, however, that most authors who are assured of the complete digestibility of goat's milk, and who recommend its use above all others, base their opinions on results obtained from feeding children several months old. It is pointed out that the digestibility of goat's milk depends largely upon the action of the salivary glands, and that these glands in infants produce very little, if any, saliva previous to the cutting of their teeth. Whatever there may be in this contention its discussion will be left to the medical fraternity for experimentation. There can hardly be a doubt, however, as to the wholesomeness of the milk for children, the term being used in a general sense.

— It is interesting to note here that of all domestic animals the goat is probably the best foster mother. She will readily adopt infants, calves, lambs, colts, or pigs. In some countries infants take the milk direct from the udder, and for this purpose the goat willingly enters the house, says B. R. Haddrup, and seeks the infant on the bed. Haddrup also says that the goats conceive a liking for the life which they nourish, "since they conduct themselves with extraordinary willingness toward the one who takes their milk in the matter of gratifying the whims of the suckling or of the person who milks them." With lambs they will lie down entirely when these can not reach the teats.

Below are quoted some opinions from writers upon the subject regarding the use of goat's milk:

Apart from its medicinal qualities, however, goat's milk is, for domestic purposes alone, far superior to the ordinary milk supplied by dairymen, as all who have tried

it can testify. Boiled and used with coffee it is delicious, giving the latter a rich, creamy appearance, while a few drops in a cup of tea are more than equivalent to a teaspoonful of cow's milk. When used in cakes and puddings its superiority is quickly apparent, both to the sight and taste, imparting a rich yellow color to these articles when cooked, and thereby acting economically by lessening the requisite number of eggs. Its only disadvantage for cooking purposes is its liability to curdle, which it is very apt to do if used rather old. It bears diluting well, and even when mixed in the proportion of half and half is by no means "sky blue."—*Pegler*.

Invalids for whom a milk diet is prescribed will find goats by far the best source of supply, as, besides being better in feeding power, goat's milk is very much easier of digestion than that of the cow, the reason being probably the extreme minuteness of the fat particles. For this reason, also, the cream does not rise so rapidly, and thus the milk contains almost the same amount throughout the day, a peculiarity which, while it is a disadvantage where the making of butter is the object in view, is of great advantage in cases where it is desired to use the milk in its natural state. Cream rises most rapidly in the first few hours that milk is kept; hence, in feeding an infant or invalid upon cow's milk, it will be seen that the cream will be in greater proportion at the beginning of the day, and the food approximate more to skimmilk as the day advances—a variation that may be quite enough to derange an infant's digestive organs.—*Hook*.

It would seem that goat's milk, which has for so long a time been rejected on account of its odor and composition, is about to be used much more extensively. Doctor Marfan has shown that in fresh milk there are certain zymoses which are destroyed by heat. The goat's milk does not contain any more casein than woman's milk, and according to Crepin's analysis the amount of casein and butter is about the same as in human milk. Doctor Boissard, obstetrician of the Paris hospitals, published last year a report on the results given by the use of goat's milk, and the latter were favorable. There is a special establishment in Paris where goats from the French and Swiss Alps are kept. The greatest cleanliness is observed, the jugs being washed in boiled water at milking time; the milkmen are obliged to wash their hands with soap; and the bottles and milk cans are sterilized by being boiled in a solution of carbonate of sodium. It is a well-known fact that the goat does not readily contract tuberculosis, and this, of course, is a guaranty of some importance.—*The Medical Times, May, 1902; Modern Medicine, July, 1902*.

Goat's milk has the advantage over cow's milk of being free from tubercle bacilli, and can be taken quite fresh. Contrary to general opinion, the taste is not disagreeable if the animals are properly selected and properly kept, being considered of a more delicate flavor than cow's milk. The quantity of fats, casein, and salt varies greatly in the different varieties of goat. For infants and dyspeptics the weaker milk may be chosen, while the stronger answers better for debilitated subjects.—*Paris Journal of Medicine*.

Goat's milk is said by physicians here to be freer from the tubercles [germs] and more nourishing than any other milk, and hence is often prescribed for patients with a consumptive tendency. I am told that, except for the above-mentioned qualities, goat's milk is of no greater value than the milk of the cow. In fact, it is stated that the latter, when boiled, is quite as good as the milk of the goat; but, inasmuch as many persons dislike boiled milk, fresh goat's milk is prescribed instead. In French Switzerland—at Lausanne, Vevey, and other places—boys go from house to house with a half dozen goats, supplying milk as it is called for by milking the animals on the premises. * * * The Canton of Appenzell, in northeastern Switzerland, is particularly noted for "Kurorte," whence is dispensed the milk of the cow and the goat.—*Consul-General Irving B. Richman, in Consular Report, 1898*.

CHARACTERISTICS OF GOAT'S MILK.

Besides the matters of flavor and odor, which are discussed elsewhere, the leading characteristic of goat's milk is the small size of the fat globules. These are so small, according to Voelcker, that hardly any cream rises on allowing the milk to stand at rest for twelve hours or longer. Referring to certain tests, he said: "One of the samples threw up scarcely 1 per cent of cream and two others none at all on standing for twenty-four hours." This condition of the milk makes the ordinary method of separating the cream impracticable.

As to the keeping quality of goat's milk, Pegler says it is not equal to that of cow's milk, but some tests in the United States within the past year showed that there was no more difficulty connected with the keeping of goat's milk than that of cow's milk. There seems to be no reason why there should be anything inherent in this milk that would tend to cause it to "change" sooner than cow's milk; and experiments will probably show that the keeping quality of the milk of goats, as well as that of cows, depends not upon any inherent characteristic of the milk, but upon the cleanliness exercised in drawing it and caring for it.

The color of the milk is nearly always pure white. When a doe is "fresh," or has but recently kidded, there are rare instances when the milk is tinged slightly with a yellow color.

YIELD OF MILK.

The first question that most people ask concerning this industry is, "How much milk will a goat give?" A moment's reflection is sufficient to convince one that this question can not be given a definite answer. Such matters as the healthfulness of the animals, the character of feed, the regularity of feeding, the kind of breed, the age of the animal, etc., have an important bearing upon the quantity of milk produced.

A doe that yields less than a quart a day is not considered a good milker; if she yields 2 quarts a day she may be regarded as profitable, provided lactation may be maintained six or seven months. Pegler says that a doe yielding 3 pints a day with her first kid "need not be set aside as an indifferent animal, as she will, in all probability, give twice that quantity on subsequent occasions." The German literature is full of instances of goats that yield 4 and 5 quarts per day, and it appears that the average in Germany and Switzerland must be not far from 3 quarts. Indeed it is stated by German writers that many goats yield ten times their body weight of milk annually, and exceptional animals as much as eighteen times their weight.

In its form the goat exhibits, as it were, the complete type of a milch animal, and by demonstration gives annually ten to sixteen times its own weight in milk, and

considerably more even, whereas in the case of the cow we must be well satisfied with five times its weight.—*Petersen*.

The milk reaches ordinarily ten to twelve times the body weight, exceptionally eighteen times this weight, in each year. In the case of very good goats, from 4 to 5 liters^a can be produced for each kilogram of body weight, or, at the least estimate, double what a good milch cow can show for each kilogram of her weight.—*Zürn*.

If we take the live weight of a goat at 30 kilograms (66 pounds) and the annual yield of milk at only 300 kilograms (660 pounds), it will appear that goats yield in milk in one year ten times their live weight. Animals with large milk-yielding capacities can, if well fed, yield annually 800 kilograms (1,760 pounds), or even more.—*Fleischmann*.

Petersen states that one Langensalzaer goat gave 1,800 liters in one year, and that this breed has been known to give a maximum daily yield of 10 liters.

As suggested in the first paragraph on this subject, the matter of quantity depends much upon the breed. Probably the heaviest milker of all the breeds is the Nubian, which is not adapted to most parts of the United States. This breed yields from 5 to 12 liters per day. The Swiss breeds often yield 4 liters per day. Dettweiler publishes the annual yield of twenty-four goats in the vicinity of Altenburg, Geising, and Lauenstein, as follows:

	Liters.
9 gave	600 to 700
7 gave	700 to 800
4 gave	800 to 900
1 gave	900 to 1,000
3 gave over	1,000

Ten animals in the city of Sebnitz were also reported upon, and their annual yield was as here shown:

	Liters.
2 gave	600 to 700
2 gave	700 to 800
3 gave	800 to 900
1 gave	900 to 1,000
1 gave	1,100 to 1,200
1 gave over	1,200

It should be stated in connection with the above results that these goats were not purebred animals, but they had been bred from selected parents, which is true of most of the goats of Germany. This may indicate a policy for us to pursue in this country, where we are not so fortunate as to have many purebred animals; the two instances mentioned below, while no doubt very rare cases, nevertheless show the possibilities in this line.

Col. I. Washington Watts, of South Carolina, crossed an Angora buck upon a common doe, and thus produced a doe that gave "4 quarts of as good milk as any cow on my plantation." Elsewhere is shown

^a A liter equals, approximately, $1\frac{1}{16}$ quarts, the decimal equivalent being 1.05668.

a picture of Watita (pl. 1, figs. 1 and 2), an American milch goat. According to her owner, "when fresh she was milked three times a day and gave almost a gallon of milk per day of very good quality."

The quotations given above are from authors who write of the best breeds of goats in countries where they have done well for scores of years; but while every condition in the United States seems to be favorable to the milch goat industry, it is possible that some difficulties may be encountered. In England, for instance, the climate is not so well adapted to goat keeping as that of other European countries, and some breeds, indeed, can not exist there. One of the results in England is the reduced yield of milk. Pegler's statement below is doubtless based upon this fact:

I have received positive assurance of full 4 quarts having been reached, but, as I never myself saw a goat that gave a gallon per day, I can not vouch for the accuracy of the statement. The largest quantity I ever obtained myself was $3\frac{3}{4}$ quarts, *accurately measured*, the milking being performed thrice daily, and with the utmost regularity. I should state, however, that special feeding had to be adopted to keep up this yield, the animal being naturally a voracious eater, and with an extraordinary fondness for water.—Pegler.

Several of the quotations given under this head refer to the body weights of the goats, and the question will arise as to the weights of the different breeds. Wherever reliable information has been available on this matter it has been included in the description of the breeds; but it is a matter of regret that the average weights of a very few only of the breeds are to be found.

COMPOSITION OF THE MILK.

It is not probable that any two analyses of the milk of any breed would agree; indeed, analyses of the milk from one animal taken at different times of the day seldom agree exactly. The ingredients of milk are influenced by the breed, by the kind of feed consumed, by the time of day when the milk is drawn, by the particular part of the milk—whether the first or the last part—and by other minor causes. Therefore any analysis must serve only in a general way to show what the proportionate ingredients may be.

Composition of goat's and cow's milk.

[*Österreichisches landwirtschaftliches Wochenblatt.*]

Element.	Goat's milk.	Cow's milk.
	<i>Per cent.</i>	<i>Per cent.</i>
Water	85.6	87.5
Dry substance.....	.7	.7
Casein.....	3.5	3.5
Albumin	1.3	.5
Fat.....	4.6	3.5
Sugar	4.3	4.3

FLAVOR AND ODOR OF THE MILK.

The flavor of the milk of the goat is affected, as is the milk of the cow, by the character of feed and surroundings. The milch goat is generally regarded as a scavenger; and because it is a scavenger and thus able to secure a living and produce milk without expense to its owner, it is kept in foreign countries by those who are unable to provide feed. Most of the milch goats of Italy, of Malta, and of the Orient subsist in this way, and therefore one can easily understand how the notion has become so prevalent that all goat's milk is of poor flavor and bad odor.

The American people understand fully the causes that produce bad milk in cows, and will not expect anything radically different in the goat. If the goats are permitted to roam about the streets and alleys at will and pick up garbage, one may expect to find the milk off in flavor. In European countries the animals supplement their diet of garbage with such weeds and twigs as they can secure by the roadside and on the mountains, and this vegetation consists, to a considerable extent, of aromatic plants and shrubs. All these things have their influence upon the flavor of the milk.

The principal source of the bad odor so frequently noticed in goat's milk is the dirt which falls from the body of the animal into the milk at milking time. This may be very easily understood, and the matter of cleanliness in milking is at once suggested as the remedy. Another common source is the buck, whose skin emits the odor so characteristic of nearly all breeds of goats. Proper care is not exercised in keeping the buck separated from the does that are giving milk. It is specially objectionable to have the buck near during the operation of milking, as the milk readily absorbs the odor.

That milk when produced and drawn under proper conditions is free from ill flavor and bad odor is attested by all those gentlemen who recently imported goats from Switzerland. It is true that there is a natural taste which enables one to distinguish it from cow's milk, but it is not unpleasant.

The remedies for the objectionable features of ill flavor and bad odor lie in the proper feeds and feeding and in the management of the animals. These are subjects which will receive attention elsewhere. However, it seems desirable to quote here some opinions on these matters as expressed by foreign writers:

Many persons are impressed with the idea that this milk has a peculiar flavor, but this impression is entirely erroneous, for when drawn *clean* from an animal in health it resembles cow's milk, both in taste and appearance, the only difference being that it is richer, thicker, and slightly sweeter, containing as it does a larger proportion of sugar and cream and less water.—*Pegler*.

The milk from goats fed upon what an English meadow or roadside yields has no flavor to distinguish it from cow's milk, except, perhaps, its extra sweetness and creaminess; in short, it is only distinguishable by its superiority.—*Hook*.

An aftertaste of goat's milk, according to statements of veterinarians, should not exist, and if any such taste or smell should exist it must be traced to unclean stables or bad feed. Even cow's milk very frequently smells badly under these conditions.—*Milch-Zeitung*.

It [the milk] possesses a singular but not unpleasant sharp taste, the strength of which varies with the feeding and keeping. The better the feed, the cleaner the bedding, the better ventilated the stall, and the more painstaking the care, just so much more pleasing will be the taste of the milk. The goatish taste is always to be attributed to the lack of attention to one or more of these points.—*Dettweiler*.

A scrupulous care of the skin itself is absolutely necessary, even with the best conditions of bedding. If, on the one hand, the pores of the skin, which partly serve to bring air into the body and partly to emit excrementitious materials from it, become filled with dirt and stopped up, metabolism suffers; and, on the other, the materials remain in the body, the proper excretion of which is interfered with. Thus the rather unpleasant aftertaste of goat's milk, for the most part, is to be traced to the fact that the gaseous and liquid excrementitious materials can not pass from the body because of the occlusion of the pores of the skin, and they therefore impart to the milk their unpleasant taste. The milk of healthy and cleanly goats has the same good, wholesome taste that cow's milk has, and excels it in the amount of fat and albumen contained. For these reasons it is imperative carefully to observe the following points: (1) To clean with a brush and comb—first upward, then lightly downward—each day; (2) to wash the goats with soda water or soapsuds on still, sunny days in the spring before turning them out to pasture, and again in the fall before housing them, repeating the operation a few days later in each season; by this means all vermin is destroyed and many skin diseases prevented; (3) to look carefully after the cleanliness of the udder by washing it frequently and with great care and pains.—*Kloepfer*.

It is admitted that goat's milk sometimes has the smell of the buck. Much can be done toward lessening this and toward its ultimate entire removal by furnishing a dry, sweet stall bedded with lots of clean straw, by good care of the skin, and by permitting the continuance as long a time as possible in the open air.—*Zürn*.

PERIOD OF LACTATION.

There are many conditions which have an influence upon the period of lactation, such as breed, individuality, feed, and regularity of milking. Purebred goats yield milk a much longer time than other kinds. This is owing to the fact that they have been bred with a long period of lactation as one of the leading objects in view. It is also true that individuals among all breeds excel in this particular, a fact which is not uncommon among cows. Good feed regularly supplied is a necessity to a long period of lactation, and everyone who has handled cows knows how necessary it is that the milking be done regularly if a full and constant flow is to be maintained. The same principles hold good with goats.

It may be said in a general way that the period of lactation is about seven months. The time may be lengthened in purebred animals by special effort, but with the common goats of this country the time is from three to five months. The reason for this short period is because the goats have not been bred with milk characteristics in view. All

things considered, it is best that the doe be required to kid but once a year. She should not be milked up to the time of kidding anew.

In this country, where the milch goat industry will be largely dependent for its growth for a long time yet upon selected common goats, there will probably be some difficulty in securing a period of lactation exceeding four or five months. Crossbred animals from selected common does and purebred bucks ought to lengthen the period of lactation, as well as to increase the amount of milk. There are now several purebred Toggenburg and Saanen bucks in this country, and, if they are judiciously employed to the fullest extent, their influence for a long flow and a large flow of milk ought soon to be decidedly in evidence.

Where goats have been handled most intelligently in Europe for family use, the plan is to have not fewer than two does for each family. One of these should kid in the springtime and maintain a milk flow for not less than six months, while the other should be so managed as to kid six months later than the first one and also maintain a milk flow for six months. This plan provides for a constant supply of milk, and is specially desirable if there are small children in the household.

THE OPERATION OF MILKING.

The operation of milking goats is not in essential particulars different from the milking of cows, but there are some features about this operation that should be borne in mind, and these will be mentioned here.

In some of the European countries the flock of does is driven through the streets from door to door and the milk drawn by the goat-herd in quantity as ordered. This method is not recommended, as its tendency is to cause the goats to "go dry." It is said that the custom has come into vogue because the purchaser distrusts the seller, and that, even when the milking is done before the purchaser's eyes, the goatherd is often requested to invert his milk cup in order to show that it contains no water. The accompanying illustrations show such herds in Malta (pls. 5 and 6). The one who milks draws the milk while squatting behind the goat. This peculiar attitude is taken in milking, it is said, because the animal can not be trained to set her right foot back as a cow is trained to do. The English, however, milk from the side and have no difficulty in doing so.

The goat about to be milked should be placed on a box or table about 18 inches high. If she is given feed here while being milked there will be no difficulty in getting her to come to the box and remain there until the milking is done. Dr. William More Decker, of Buffalo, writing recently of his experience with his imported does, said:

The does will come to the milking place as soon as the door of their pen or barn is opened, in expectation of receiving their mess of oats. Last summer I milked three

does and each would come in turn as soon as the door was opened. They were given oats in a large measure. The first was allowed to eat until she was milked, when she was returned and the next doe was at the door ready to come out.

Sometimes it happens that a young doe will object vigorously to being milked, and in such cases it has been found necessary to secure the animal by the head. A frequent practice is to use a contrivance called a guillotine fastener, or guillotine board. This consists of two boards with half-round notches, which when placed together fit around the goat's neck. The lower board is fastened securely in position, while the upper one may be moved up and down so as to admit or release the doe. Other methods will suggest themselves to people who are accustomed to milking cows.

Under no circumstances should milking be done in the stalls or in the barn where the stalls are located. The buck should not be in the place where the milking is done, or so near that his odor may be detected, for, as stated in another place, the milk is very ready to absorb this odor.

Regularity of milking should be maintained. When the does are in full flow, they should be milked three times a day; for if not, the udder will become so distended as to be exceedingly painful and the flow will decrease rapidly. A disregard of this point is apt to render futile all other efforts in the way of breeding, feeding, and care.

Kindness and gentleness are now recognized necessities in the best cattle dairies. These characteristics are even more necessary with goats. On this point Von L. Albrect is quoted:

Milch goats will be particularly gentle and of kind disposition when handled and cared for, so far as possible, by the same person. To this end, the milking must be done with regard to gentleness and regularity, and with the closed hand so far as possible. The strokes and tugs must be performed with care. The milking is done best by a stroke directed from above downward.

The following practical remarks by Renesse deal with the general subject of milking:

Before beginning to milk, the two teats are to be washed off with lukewarm water and then dried off with a soft cloth, also the udder is to be stripped a few times from above downward. It is advisable that the animal be milked by one and the same individual, with clean hands, at regular and definite times. The milk pail is to be entirely sweet and clean. Milking must not be done in the stall. Tuberculous persons must not be allowed either to expectorate in the stable or, much less, to milk. That the milk may not depreciate in taste, it should be put away in a suitable place. A statement of the amount of milk given daily should be kept in a book by dates, in liters, in order to have an accurate account as to the profit.

TRANSPORTABILITY OF THE GOAT GIVING MILK.

Another feature about the milch goat that is advantageous is that, in the case of a sick person or an infant traveling, the goat may very easily be taken along on the journey for the purpose of furnishing

milk. This is a frequent practice in England and is not entirely unknown in our own country. This custom will enable a person to enjoy a change of climate and still keep his regular supply of one kind of milk, both of which are conducive to health. It is well known that with infants a change of milk from one cow to another will oftentimes produce disorder in the system, and, of course, it is not practicable to take a cow along, "as one of the family," as the goat can be taken.

If the experience to be gained in the United States shall confirm all the claims made for goat's milk in Europe, there is a suggestion in the above that is worth considering. In the summer season there is an exodus from all of our larger cities of a considerable number of people who seek temporary locations in country places or in the mountains, and among them are hundreds of mothers with infants requiring pure milk and pure cool air. If such resorts should maintain a flock of goats for the benefit of such children—or for other people, if need be—the resulting benefits would be greatly enhanced. Inquiries as to the existence of just such places have been received by the Bureau of Animal Industry, and the idea of their establishment seems practicable.

GOAT DAIRIES.

The question is raised in the paragraph above as to the advisability of keeping goats at mountain health resorts, and here the question will be raised as to the probable value of a goat dairy. Since there seems to be an almost universal indorsement of goat's milk for children and sick people, we may well consider the advisability of the establishment of dairies for supplying the city demand for the milk. Inquiries from physicians of various cities are already sufficient to justify the belief that there is such a demand. The cost of a small dairy need not be very great, and it might be worth the while of physicians to lend such an institution their moral support.

The price to be obtained for the milk will depend largely upon circumstances. In a few instances where some has been sold, the prices ranged from 12 to 25 cents per quart. At this writing the milk of goats in the vicinity of Palisades Park, N. J., is selling for 12 cents per quart. In this case the milk is not used for hygienic purposes, and most likely it is not produced and cared for according to recognized sanitary methods. Better prices will probably obtain where the milk is properly produced for consumption by puny children and sick people.

If such dairies are established and prove successful, other matters of development will demand attention, such as the manufacture of cheese and condensed milk. A few remarks on cheese are given elsewhere, and only a sentence will be given here with reference to condensed milk. Goat's milk in this form is already found in the markets of

Europe, and there can be no question that it will fill a want where it is not possible to obtain the milk in a fresh state. It should supplant entirely the use of such milk from cows, which is now used by thousands of infants during the first few months of their lives.

GOAT'S CHEESE.

It does not seem practicable to include much in this paper regarding the manufacture of goat's cheese. If it shall appear later on, after the establishment of goat dairies, that the manufacture of cheese should be undertaken, the matter will then no doubt be discussed by some one who is familiar with all the processes, which is not the case with the present author. Nothing further will be attempted here than a few general remarks, in order that those who are uninformed on the question may know that the manufacture of cheese from goat's milk is a very important one in Europe.

The cheese that is made from goat's milk is considered very choice and always brings good prices. Some of the varieties quite well known in the United States are the Roquefort, Ricotta, Schweitzer, and Altenburger. It is stated that on an estate near Lyons, France, 12,000 goats are kept in flocks of 40 to 60 for the purpose of cheese manufacture.

The goat's cheese made in the vicinity of Mont d'Or, France, near the Swiss border, enjoys a world-wide demand, and there are employed at this place about 15,000 goats. We are informed that the annual production of cheese there is valued at 1,500,000 francs (\$289,500). The French goat's cheeses worthy of special mention are Fromage de St. Marcellin, St. Claude, Cheveretin, Gratairon. The first one is a combination of the milk of the goat and the sheep, which also is the case of most Roquefort cheese.

The strong taste and odor of goat's cheese are qualities very pleasing to many. In Norway a goat's cheese called Hoitcost is quite a favorite. On this account the French, German, Dutch, and Swiss dairymen, especially the last two, have been in the habit of making cheese of an especially pronounced odor and flavor, and, in pursuit of this habit, some of them have used the milk of the goat in part with that of the sheep and the cow in the making of cheese; but while in some instances the milk of the sheep is used wholly for a special kind of cheese, that of the goat is only used when mixed with the ewe's or cow's milk, simply for the purpose of securing the special flavor of it; and, as the special kinds of cheese thus made find a market in our large cities to considerable extent and at high prices, it is quite probable that the making of this kind of cheese may become an established and quite profitable industry; and, in fact, in view of the great enterprise and ingenuity of the American citizen in all the business of life,

it may easily become so to an enlarged extent when goat's cheese shall be offered in our markets.

With reference to the manufacture of goat's cheese, Renesse gives the following:

The milk is treated in a kettle warmed to 25° to 26° R. [or 88° to 90° F.], and, while being stirred evenly, is brought to coagulation by the addition of rennet. By this means the so-called curd is separated out of the whey. The curd is then manipulated with a strainer and the whey allowed to run off. When the curd after several hours has become dry, salt and caraway seed are intimately mixed with it and it is made into small cheeses. These little cheeses are to be placed on racks in the cellar to dry and are turned daily. After about fourteen days they are ripe and ready for use. The cheese takes on an especially fine taste and sweet odor if, after a long period of ripening, it be laid in the dried leaves of the sweet-scented woodruff. As a rule 1 kilogram of cheese can be obtained from 10 liters of milk.

GOAT'S BUTTER.

It is not deemed worth the while or the space to say very much here about goat's butter, for at best it is said to be a very poor substitute for the article made from cow's milk. In the Orient, especially in Syria, goat's butter is frequently but not extensively used. It is served to American and European travelers in that land and they find it almost unbearable. The cream rises upon the milk very slowly because of the smallness of the globules of fat, as has been explained before, and therefore in order to secure practically all of the cream the milk is permitted to stand until it becomes thoroughly soured. Very little effort is made to keep the milk free from dirt, and consequently the long period of setting intensifies the injurious effects of the dirt.

Some of the characteristics of the butter are its whiteness and softness. Very rarely it has a yellowish tinge. The taste is said to be pleasant if made under modern sanitary conditions, yet it is inferior to cow's butter.

Composition of goat's butter.

[Milch-Zeitung, 1893, p. 756.]

Element.	Per cent.
Water	8.2
Fat	86.5
Salts and ash	3.7
Proteids9
Carbohydrates7

GOAT'S WHEY.

Goat's whey is highly recommended by foreign authorities for its medicinal and nourishing properties. Zürn says it is recommended especially for diseases of the lungs and for anemic persons suffering

from innutrition. As this feature of the milch goat industry is not likely to become a matter of importance in this country for some time yet, nothing further will be given here except an analysis, as below:

Composition of goat's whey.

Element.	Per cent.
Fat	0.02
Sugar	4.969
Salts665
Albumin581
Water	93.765

IMMUNITY FROM TUBERCULOSIS.

Some writers state with great positiveness that goats are absolutely free from tuberculosis and therefore the milk from goats can not be affected with tuberculosis germs; others state, however, that this claim is too strong to be borne out by the facts. If the claims of the first class were strictly true, it could well be said that the goat would not only be a real boon to humanity but would also be the most useful of all domestic animals. It will probably never be known just how many people contract tuberculosis by drinking the milk of tuberculous cows, but it is well known that the number is considerable. It is quite generally agreed at this time that this disastrous disease is acquired rather than hereditary, and that one source is milk from diseased cows. Renesse says, in discussing the advantages of goat's milk, that "In Germany 100,000 people die annually from consumption, and the number of those sick from the disease is estimated at ten times this number." In all probability the death rate from this disease is just as large in most other countries. If all this be true, surely all efforts are dignified that have for their object the eradication of tuberculosis. If goat's milk is really helpful to the attainment of such an object, it should be given the most extensive use. Milk is the first food of man and he is dependent upon it, to a large degree, throughout life.

It will not be out of place to suggest here that that freedom from tuberculosis, which is so often asserted, is due to the feed and climate where the animals are found and to the exercise obtained in roaming over the mountain sides. It may be that when confined in close quarters with cows that have tuberculosis the goat will also contract the disease; in other words, its freedom may be due to environment rather than to a physiological immunity.

It is not the purpose of the present writer to enter into a discussion of tuberculosis. That matter will be left to the medical fraternity. The purposes of this paper will be subserved by giving some of the opinions of foreign authors, in order that we may know what thought is being given to the subject abroad.

A German agricultural paper indorses goat's milk because of its "antitubercular properties, insuring a pure milk yield;" and the paper continues:

Since Löbe, Rhode, and others ascribe to goats an almost total immunity from tuberculosis, Koch makes the statement, in his first study concerning tuberculosis due to infection of cow's milk, that recently there are well-authenticated cases recognized in the literature due to inoculation by cow tubercles or in consequence of rearing goats on tuberculous cow's milk.

Hilpert says that since the goat is much more healthy than the cow and sheep, tuberculosis (which can be transmitted from them to man) attacks it very rarely, and so its milk is very much better and is especially adapted to children.

Renesse says, with reference to the milk of the goat, that there need be no "fear as to the transmission of tuberculosis."

Doctor Schwartz, medical counsellor from Cologne, in an address at Frankfurt (1896) before the Association of German Naturalists and Physicians, directed the attention of the convention toward goat's milk as a food for children because goats rarely have a tendency to tuberculosis, and even when they have it they become infected by coming in contact with tuberculous cattle.

While the statement is not entirely true that goats are absolutely immune from tuberculosis, yet of 1,500 goats publicly slaughtered in one year only 0.6 per cent were affected. This bears no comparison to the prevalence of tuberculosis among cattle. For example, in the slaughterhouse at Kiel, Germany, in 1896, 41.03 per cent of all slaughtered cattle and 45.82 per cent of all cows were found to be tuberculous.—*Hoffmann*.

Undoubtedly the most important of all the qualities of goat's milk, especially in its relation to its adaptability to the feeding of infants, is its immunity from the danger of carrying the germs of tuberculosis.—*Hook*.

In the Kingdom of Saxony, according to a report concerning veterinary affairs for the year 1894, it is stated that out of 1,562 goats slaughtered only 10 (0.64 per cent) were found to be tuberculous, of which 2 were destroyed, 1 was kept under observation, and 7 were found salable. In Prussia, in 1899, in 381 slaughterhouses 47,705 goats were killed. Of this number only 148 head (0.41 per cent) were infected, either generally or locally. This result must be the more astonishing because the goats, with only a few exceptions, were kept under conditions eminently favorable to the spread of tuberculosis. Petersen, quoting these same figures, says that the goats ran freely in the cattle sheds, ate out of the racks with tuberculous cows, and, owing to the well-known proclivities for mischief, took hay out of the mouths of the cattle, whereby they exposed themselves to the greatest possible infection.—*Dettweiler*.

Assistant Eichhorn informs us as follows in Report of Veterinary Science in Imperial Saxony, concerning the appearance of tuberculosis in goats: "There was a goat (in a large herd of 28 head) which had been brought for treatment and which after its death, which soon followed, was found to be tuberculous to a high degree. This made it imperative to inoculate the remaining 27 head with tuberculin. In 18 of these, in consequence of the inoculation, a rise of temperature occurred of 1° to 2.5° C., and only in 9 did the increased temperature amount to less than 1° C. (0.6° to 0.9° C.). Because of this result 68 per cent of all the goats had to be retained

on suspicion of being tuberculous, and only 32 per cent were to be looked upon as probably free of tuberculosis. The owner could only make up his mind to have 3 slaughtered, of which 2 were suspected of being tuberculous and 1 was probably free of the disease, the result justifying the conclusion that the diagnosis was correct. This shows that a greater degree of care is necessary in the use of goat's milk as food in the milk cure."—*Deutsch Landwirthschaftliche Presse*.

MANAGEMENT OF THE GOATS.

The buck.—The management of the buck is of the utmost importance if it is desired to conduct the goat business along definite plans. If carelessly managed he will upset all plans. It must be remembered that the male of all breeds of goats, except the Angora breed, is in heat at all times, and that the doe comes in heat about every three weeks, except during the months of July and August. This means that if the buck is allowed to run with the does the kids will oftentimes be coming at the most inopportune seasons, which is not at all desirable. If milch goats are to be kept for family use or for dairying, it is necessary that breeding be done according to a schedule, so that a constant milk supply may be had throughout the year.

Besides the objection to breeding at the wrong season, there is the further objection of breeding the does too often. Usually, if not restrained, most milch goats will breed twice a year, and sometimes it occurs that kids will be dropped three times in one year. This is putting too much strain upon the does, and the best results can not be obtained by the practice.

The buck should always be kept away from the does except when desired for service. By this practice he may be kept in better condition on a less amount of feed than if allowed to run with the does all the time. His presence in the goat barn, especially if milking is done there, is very objectionable. The strong odor which he emits will readily be absorbed by the milk and is the principal source of this odor. His place is in a separate barn and yard and pasture.

Best results are obtained where the buck is always in good condition. It may be necessary to feed him some grain in the winter, but it should not be enough to make him quite fat. He will thrive better and have a more kindly disposition if he is frequently brushed thoroughly.

The doe.—The fact that a doe may be bred to drop her kids at almost any time desired is one of her advantages as a milk-producing animal. If two or more goats are to be kept for household use, it is desirable that there be a constant supply of milk; and, in order that this supply may be produced, the does should drop their kids from four to six months apart.

If a household is to be furnished with goat's milk, matters should be so arranged that this supply may be fairly constant. As one goat

is not capable of furnishing this supply for the entire year, two or three goats should constitute the basis of the household supply.

The matter of feeding is discussed elsewhere, but it should be stated here that goats in lactation should be fed in the same manner that dairy cows are fed. The feed that will produce milk in the one will do the same in the other.

It is surprising how much butting and knocking about a doe can receive without injury even up to within a short time before kidding;

but it will always be unsafe to leave the does among the other goats too long after they show evidences of pregnancy. Two or three weeks before the kids are due it is well to shut the does away from the other goats. If she is kept in the barn she should be loose in a pen or box, as shown in figure 1, and kept there until the kids come. Her future handling will depend upon the disposition to be made of the kids. (See "Raising the kids," p. 40.)

THE GOAT BARN AND YARD.

The goat barn is a necessity, though very inexpensive expedients may oftentimes answer. No one need expect to obtain a heavy flow of milk from does that are compelled to endure all sorts of weather. Everybody knows this fact in connection with the keeping of

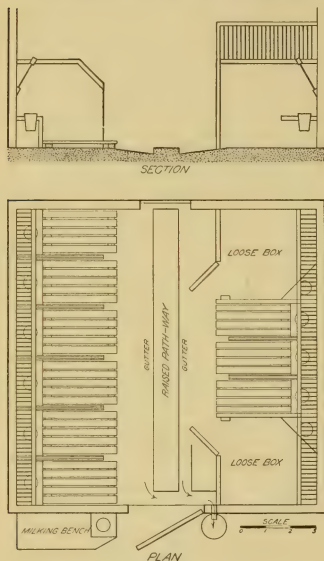


FIG. 1.—Plan of goat house. (Copied from Bryan Hook.)

dairy cows; how much more should be demanded of a goat? The goat dislikes rain and mud, and will avoid contact with either if possible. While warm rains do not prove injurious, cold rains, sleet, and mud are very detrimental to grown goats and are almost sure to cause death in the very young kids.

The principles that should be observed in constructing a goat barn are the same as those governing a dairy barn. The matter of ventilation is of special importance; for there is no domestic animal that

suffers so much as the goat when it is deprived of an abundance of fresh air. There should be plenty of light, and the sun should be enabled to shine in. If there is an abundance of room for the animals, all the better; crowding is always detrimental.

The better barn is one that has a loft above, where the hay is stored, and this hay can be fed into a manger or rack from above. The rack is better in many respects. The hay in it is easy of access, and not so much of it will be spoiled by the goat as when it is in a manger where the entire lot may be mused over. Below the rack a board is fitted across the end of the stall, and through this board a hole is made for holding a pail or other similar vessel containing feed. The advantage of this is apparent. This board should be strong, as the animal will use it as a footboard in order to reach the higher for hay in the rack above.

The stalls are usually from 2 to 2½ feet wide, and the partitions between the stalls extend back about two-thirds the length of the goat. This length is sufficient to keep the goats from interfering with each other when feed is given. Each stall should have a floor raised slightly above the earth. This floor should be made of narrow pieces of lumber, and a space left between the pieces so that the liquid manure may pass through and away. It should extend beyond the partition so far that the goat when tied in its stall will not step off.

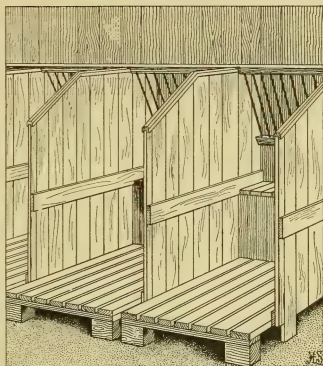


FIG. 2.—Suitable goat stalls. (Copied from Bryan Hook.)

The illustration given herewith (fig. 2) is reproduced from Bryan Hook, and seems to answer all the purposes of a satisfactory barn. The "loose boxes" shown in the two corners of figure 1 are for the kids or for does soon to kid. Attention is also called to the milking bench on the outside of the barn. If desired this bench may be under cover, but it is always well to do the milking away from the stalls and the other goats. Some goatmen build their platforms in the stalls about 18 inches high and then milk the goat there, but this is not the best plan if it is desirable to obtain milk that shall be free from bad odor and bad taste.

I give herewith a plan of one of my own houses, the arrangement of which I have found to work well. It is designed to provide the greatest amount of accommoda-

tion in a limited space, the inside measurement of the house being 12 feet square. The building is of wood, lined inside, and the intervening space packed with straw and shavings; thus it is seldom that frost can effect an entrance, a point of some importance if it is desired to obtain milk in winter. There are six 2-foot stalls on one side, and on the other three 18-inch stalls, and two loose boxes, the latter to be used for goats that are expected to kid or for shutting kids away from their dams.

The upper part of the loose boxes is made—as are also the hayracks—of $\frac{3}{4}$ -inch iron bars. Down the center of the house is a raised path with gutter on each side, so arranged that the liquid manure is discharged into a pail, as shown by the direction of the arrows. The milking bench is in the open air, but is protected from rain by the eaves of the thatched roof. This bench will be found a very necessary piece of furniture, for though the animals can be milked in their stalls, the operator will be apt to find the stooping posture extremely irksome. If this bench, about 18 inches high, is placed in some convenient situation and fitted with a manger in which the goat's ration of corn or meal is placed, she will require very little training to mount it willingly the moment she is released, and in this position the milking can be done with comfort. Even a young goat that has never been milked before will learn in a few days to stand quietly, and my friends have often enjoyed a hearty laugh over the alacrity with which each in turn scampers round to the milking bench as its chain is unfastened.—*Hook*.

A good yard should be connected with the barn, where the animals may get air and exercise during the day if they do not have the run of a pasture. It is also a good plan to have an open shed in this yard, where the animals may go to get out of storms or out of the sun's heat. If there are platforms about 18 inches or 2 feet high in the shed and the yard, they will prove a matter of great pleasure to the goats, which will nearly always seek such places when they desire to lie down.

Feeding should not be done in such yards, as the goats will be certain to fight, and it will often happen that serious injury will be done to kids or to does about ready to kid. If all feeding is done in the stalls in the barn, the goats will always be ready to rush in as soon as the door is opened, and each one will go directly to its own stall, where it can eat in peace and at the same time get all that is due and no more.

BEDDING IN THE GOAT BARN.

The goat never seeks the soft places. If given its choice of a place to sleep, it will choose a rock on the highest point in reach. A bed is not one of its requirements, and is in no way conducive to its comfort; but it is desirable that some form of litter be provided, such as chaff or sawdust, for the sole purpose of absorbing the liquid manure that does not pass below the slatted platform in the stall. Straw may be used for the same purpose, but the goat is liable to clear it away by pawing. Sawdust, although a fairly good absorbent, does not make good fertilizer, and it should not be used if the stall cleanings are to be preserved for fertilizing purposes; it is, too, in most places, likely to cost more than other forms of litter.

FENCES.

In opening the discussion of this subject the reader must be assured that the goat is not the worst animal in the world to jump fences, as it is so often charged with being. It may easily be trained to jump a fence of considerable height, but ordinarily it will not attempt to jump a fence that is over $3\frac{1}{2}$ feet high. The goat is naturally a climber, and it will amuse itself in walking the top of any fence that offers an opportunity for it to get there—such fences, for instance, as the old-fashioned “worm” fence, with supports sufficiently slanting to enable the animals to walk up them. If there is just a single place where the goats may climb upon the fence, depend upon it that the whole flock will find it, and never forget where it is.

However, goats can not climb a fence that is straight up and down, neither will they be inclined to jump it; therefore, experience has demonstrated that a fence that is $3\frac{1}{2}$ or 4 feet high is sufficient to restrain these animals. This fence may be made of wire or boards or rails. If it is made of wire, it should be the woven wire, with squares, or meshes, so small that the goat can not put its head through. This precaution should be specially heeded where there are goats with horns, as with the head once through it can not get release without assistance.

The value of any fence for goats, sheep, or cattle is greatly enhanced by a strand of barbed wire about 8 inches above the fence. It tends to discourage all attempts of the animals to get out, and wandering dogs are not inclined to try to go over it.

The fence should be built close to the ground, and care should be taken to see that no opening of consequence is left anywhere, for the goat will crawl as successfully as it will climb, and it often astonishes people by its success in crawling through small openings.

SALTING THE GOATS.

Goats are very fond of salt, which serves its purpose best when given properly. While some prefer to provide loose salt at regular intervals, the usual practice is to place a lump of rock salt in a place easy of access, where the goats help themselves whenever they desire to do so. If goats are accustomed to the use of salt, they will not take too much of it; but, like other ruminants, they are likely to overdo matters if they have free access to an abundance after a period of deprivation. The writer has in mind instances where Angora goats have been killed by a too liberal supply of salt after having been deprived of it for some time.

WATERING THE GOATS.

Goats are not regarded as very great water drinkers, but when in milk they should be enticed to drink as much as possible. The water must be fresh and pure, else it will be avoided by the goats until thirst compels them to drink it. In the winter season it will be well to give it slightly warm.

CARE OF THE HOOFS.

Where goats have access to a pasture containing gravelly or rocky soil, their hoofs will be kept worn down by natural processes; but where they are confined in barns and small inclosures, the hoofs will grow to great length, and will interfere to a considerable extent with the movement of the animals. In this condition the hoof will catch and hold between the toes a large amount of dirt, which makes the parts sore, and more subject to foot-rot than when the hoof is in good condition. It is not difficult to keep the hoofs in proper condition, and, since it is necessary, it ought to be done.

FEED FOR MILCH GOATS.

All of the foreign writers on the subject of milch goats devote considerable space to the methods of feeding and kinds of feed, but, owing to the very different conditions prevailing in this country, their experiences can be adopted in a general way only. The principles governing the feeding of milch goats are the same as with dairy cows.

It will be very natural for those people who have been reading about the Angoras and their ability to destroy worthless brushwood and weeds to think of the suitability of such places for milch goats. These goats have the same appetite for twigs, bark, and weeds that the Angoras possess, and such feed may be regarded as desirable for growing animals, but when the does are in milk a sole diet of such feed is very likely to impart an unpleasant taste to the milk. Besides the unpalatability of the milk from such feed, so large a flow can not be expected as when grain in some form is fed in addition to the browse. The milch goat is a single-purpose animal; she can not produce milk satisfactorily and at the same time destroy brushwood and weeds to a large extent.

Pasturage is highly recommended by the English goat men when the pasture is large enough to really afford a change of diet, but they agree that a small pasture—such, for instance, as an acre for two or three goats—is very undesirable. They say that it is their experience that in such small pastures the goats are so often passing back and forth in their former paths that they tire of the feed and will soon show a lack of thriftiness, and death follows in a year or two. The goat prefers to wander over a large area and to gather its food in a

variety of bits here and there, and therefore a large pasture is quite desirable. However, what has just been said about such feed as a sole diet must not be overlooked.

It is a common statement that eight goats will subsist upon the amount of feed required for one cow and at the same time yield a good flow of milk. Many actual tests made in Germany are cited to prove this. Where browse is afforded as a supplementary feed 300 pounds of hay is a sufficient quantity for a milch goat annually, but in an examination of experiments where large milk production was the object in view it has been shown that some goats will consume as much as 700 pounds annually. It will be well for Americans to estimate the amount required at 500 pounds at least, since we are not so careful to prevent waste as the people of Europe. If permitted, goats will waste much hay by pulling it down underfoot; and as they are very particular about their food, they will eat nothing that is soiled or tainted.

Without hay or good, dry fodders goat keeping for milk is scarcely possible; this class of feed can not be displaced by any other. Good hay, such as the goats relish, is preferable to coarser fodders. Clover hay probably has no superior as feed for goats. It exercises a stimulating influence upon the digestive organs and serves as an active element in the production of milk. Fresh hay, which has not undergone the sweat, is difficult of digestion and easily induces bloating. Old and musty hay becomes repulsive.

Such roots as mangolds, carrots, swedes, Jerusalem artichokes, parsnips, potatoes, and turnips are regarded as excellent feed. The goats prefer the turnips. All roots must be washed perfectly clean. A common method of feeding in England is to cut the larger roots into halves and place them with the cut surface uppermost in the bottom of a pail. The goat will then work at the pieces until all the inside is completely eaten, leaving the rind. The animals seem to enjoy doing this work. It is advised not to feed the mangolds earlier than Christmas, as when fed soon after they are pulled they are likely to produce scours.

Elsewhere, under the head of "Flavor and odor of the milk," there is some discussion of the influence of garbage upon the milk; but those remarks apply especially to that garbage which is decaying and filthy and which is eaten by the goats because of necessity rather than from choice. Clean and fresh refuse from the kitchen and table, such as potato and turnip parings, cabbage leaves, and crusts of bread, are readily eaten.

In feeding grain the same judgment must be exercised as when it is fed to dairy cows. It must be of the proper kind and not fed in such quantities as to produce fat rather than milk.

Bran is considered a most excellent feed, but its use, of course, will

depend upon its cost. The daily ration of this feed will vary between one-half and three-quarters of a pound. It will be well to dampen the bran with a little salt water. Malt is recommended by some, where it can be had regularly and at reasonable cost. It is an excellent milk-producing feed, but it should never be fed sour.

Oats are specially good for goats that are dry and for kids. From one-half pint to one pint a day will be sufficient. Corn is preferred by Pegler for goats in milk; not over a pint a day should be given. He says that when it is mixed with pease or beans it forms capital food. Corn is the most abundant grain feed in the United States, and therefore ought to be of great assistance in the development of a milch goat industry. Meal, oil cake, and linseed cake are highly favored. Of the latter Kloefer says: "It is absolutely invaluable before delivery, when, on account of its digestibility and ready assimilation, it is a prophylactic against milk fever." In giving oil cake and linseed cake, it should be broken into small bits.

Some remarks on the feeding of various substances are copied herewith from foreign writers:

From my experiments, which I have conducted in the past two years upon my experimental animals, one must figure on at least 3 hundredweight of hay yearly for each mature animal. If one can obtain more, of course it is so much the better. As a means of saving the hay it is suggested that it be cut up and be fed in a narrow rack and mixed with straw. By this means the animals will be prevented from tramping the feed under foot. It is best in the morning to feed half of the day's ration of hay, mixed with equal amount of straw, and after this to give water which in severe weather has been allowed to stand in a warm room or in the kitchen. The offal from the kitchen serves as the usual noon meal, which should be given not with, but without, a large amount of liquid.—*Kloefer*.

Hay is best supplied in its entire state, but may be cut up into chaff and mixed with the provender. As, however, this requires the use of a chaff cutter, which it is not worth while to purchase merely for goats, it will be generally given as hay and not as chaff. Bulky food like this serves the purpose of filling the stomach, which requires a certain amount of distention to enable it to perform its functions properly. To effect this with corn alone would, in the first place, be expensive, and, secondly, so large a quantity of concentrated food would be injurious. In fact, hay or chaff in conjunction with corn may be regarded in the same light in the diet of a goat as bread and vegetables combined with meat in that of man. There are two kinds of hay—meadow hay, composed mainly of grass with a few herbage plants, and clover hay, made with that plant alone. The latter is generally preferred by goats, but the former is considered best for milch goats, besides also being cheaper.—*Pegler*.

It seems to be the general practice to house goats during the night and, except in the middle of summer, it is probably best to do so. They will need some food during the night—a small armful of grass or some leaves, while, if they are in milk, a few oats, say half a pint, will be an advantage. Kids should have some oats every day if they are wanted for stock. In the winter some linseed cake is of great use, and roots will have to be used—carrots, swedes, and mangels; the mangels ought not to be used before February or March. The tops are good food. All roots should be washed. A certain amount of hay must be given, but in small quantities at a time or it will be thrown down and wasted.

In stall feeding the food will be much the same. It is best given in three meals, at regular times, but the food should be varied as much as possible. This change is of great importance. A moderate-sized garden will supply most of the food required for one or two goats in the shape of waste products, such as the thinning of carrots and turnips, the spare young cabbages for which there is no room, the lettuces that have bolted, any weeds and hedge clippings, together with potato and apple peelings and dry crusts of bread from the kitchen, all kept very clean.—*Soames*.

Opinions differ as to the proper time to feed. Some favor two times a day and others three times a day. The best results from hay are when there is an abundance, and there should be some in the rack at night.

CONCERNING DISEASES OF GOATS.

It is said by those who write from experience that goats are not subject to so great a variety of diseases as sheep, but those diseases which do attack them are in the main the same as attack sheep.

For various reasons, principally because of the limited experience with goats in the United States, it is deemed wise not to enter upon a discussion of diseases that might occur. Most farmers know quite well how to handle animals with minor troubles, but conditions that become serious should call for the services of the veterinarian.

Let the owner of goats keep ever in mind that prevention of disease is nearly always easier than a cure. Given a healthy goat, provided with good feed and water, plenty of fresh air, and proper housing, we have the conditions that do not tend toward disease.

THE MATTER OF BREEDING.

The buck.—With milch goats, as with any other breed of domestic animals, it is very essential that the best buck possible should be employed. Not only should he conform to the recognized type for his breed, but it should be ascertained whether he is from a strain having well-known milking qualities. If his sire is of the proper breed and his dam a good milker, the chances are that he is a good animal from which to breed. In fact, records of the amount of milk given by the dam, granddams, and other near female relatives of bucks should be available and the selection of males should eventually be based largely on this evidence. These records are not difficult to make in flocks which are being carefully bred. There is nothing so important in breeding as evidence that the whole family is good in performance. Always avoid what are usually referred to as "common" bucks.

The number of does to be served will depend very largely upon the management of the buck. His age and constitution, as well as the character and quantity of his feed, have an important bearing upon his powers of reproduction. If the buck is allowed to repeat service several times for one doe, it is apparent that a smaller number of does

can be served than if there is one service only. When carefully managed, one buck is sufficient for a flock of fifty does.

The following description is from Pegler:

A he goat should have a small neat head with plenty of beard and neck short and thick, with abundance of hair. The horns may be large, but not too coarse and heavy. The chest should be broad and massive, the back long and straight, and the ribs well rounded, the tail being placed high up on the hindquarters. These are required to be as square as possible, the reverse being the most common failing of he goats. The legs must be straight, thick, and strong, and well covered with hair on the thighs and buttocks.

The doe.—In a measure the same characteristics possessed by the buck should be prominent in the doe. She should be of a milking strain and at the same time have the other recognized qualifications for milch goats. For convenience most foreign breeders prefer hornless goats of solid colors, but while horns and long hair may be regarded as nuisances, these features really have no influence upon the quality or quantity of the milk. It is obvious that an animal with short hair is more easily kept clean than one with long hair.

The animal should present a lanky appearance, with broad muzzle, clean-cut head, graceful neck, large in the stomach. The chest should be deep and broad and the height should be equal at the shoulders and the hips. The udder is hard rather than soft and fat. Sometimes a fat udder is mistaken for one of large milk capacity. The size of the udder varies with the length of time since kidding and also with the number of times she has kidded. It is not uncommon to see the does of pure breeding have teats that touch the ground as they walk about, especially among the goats of Malta, Spain, and India. Occasionally there are found individuals among common or crossbred goats that have udders that nearly approach this size.

The following description is by a German writer of much observation and experience:

In a good milch goat the following points are to be described: A long body, growing larger at the hinder parts and beneath, neatly rounded form, a deep and broad breast, short legs, broad buttocks, wide but filled out "hungry hole" (the depression in front of the hip bone), a neck that is not too long nor too thick, a light, broad head, wide mouth, and good udder. The udder should be of considerable size. Only those goats can give plenty of milk which have a bulky, well-developed milk gland; that is, a large udder. But it is not always the case that a capacious udder signifies a high milk yield. The amount of glandular tissue in the udder can be augmented by the surrounding flesh and fat, and then the udder is spoken of as a fleshy or fatty udder. A large udder is, then, a favorable sign of an abundance of milk when it is a genuine udder. A fatty udder feels soft and full; its skin is generally somewhat thicker, sparsely covered with long, coarse hair; does not wrinkle after milking and diminishes only slightly in circumference. A genuine milk udder feels tight and as having kernels in its upper portion; its skin is thin and tender, covered with short, fine hair, and forms very perceptible folds and wrinkles, which fall together after the milking is done, if the condition of the udder is not too tense.

Moreover, the blood vessels course along very noticeably on account of the thin skin when the udder is filled—a condition not present in the case of a fatty udder. A good milch goat should have a fine, thin skin, which is best examined over the ribs, and it should be covered with fine (not bristly), smooth, glistening hair. That the absence of horns possesses an alleged influence in making the milk mild in taste has been spoken of before. When all these characteristics coincide it is certain that one is dealing with a good milch goat.

THE BREEDING AGE.

There is probably no other domestic animal that is liable to breed so young as a goat; but, as with other animals, to permit very early breeding is to dwarf the doe, and consequently render her almost useless as a good milker. If a doe is bred at the age of 1 year she will drop her kids five months later, which is young enough if the purpose is to produce a good milker to last through several years. A buck may be put to light service at the age of 1 year, but results are more satisfactory if he is not bred till from 18 to 24 months old.

The period of gestation in the doe is about five months (from 147 to 152 days), the same as with sheep. They come in heat at all times of the year, but not frequently between the first of April and the last of August. The presence of the buck has its influence upon the appearance of heat. The doe is in heat in season about every three weeks, and the period lasts from one to three days. The signs are unmistakable, and the owner can use his judgment as to when to breed.

THE TIME TO BREED.

The information just given above shows that the owner of goats may, in a general way, choose his own time for breeding. When goats are kept for family use, where a supply of milk throughout the year is desirable, a practice is in vogue of so arranging the breeding that some of the does may drop their kids at one time and others about six months later. It is only by such a method that one can expect to have a constant supply of milk.

NUMBER OF KIDS AT ONE BIRTH.

The usual number of kids at one time from milch goats is two, but instances are not rare where there are three. Mrs. Edward Roby, of Chicago, has a doe which at one time had four kids and the next time three. A picture of this goat is shown in plate 1, figures 1 and 2. There is a record of a Nubian goat which dropped eleven kids within twelve months—four on each of two occasions and three at another.

Whether the doe shall be required to raise so many kids—or even one, for that matter—will depend upon circumstances. If the breed is exceptionally good and the kids therefore worth more than the milk, it is obvious that the kids should have first consideration.

RAISING THE KIDS.

If the sire and dam are of pure breeding, or have been selected from nondescript stock because of their milk characteristics, it might be profitable to raise the kids, but with ordinary animals the most economical plan is to kill the male kids as soon as born or as soon as they are old enough for use as meat. The object in view in keeping the female kids is milk production and flock increase; if their breeding promises nothing in the matter of milk production, which is likely if the sire happens to be of poor quality, they, too, should be slaughtered.

All things taken together, the advisability of raising the kids depends upon "dollars and dimes," and this is a matter that each breeder will be able to decide for himself better than anyone else can do for him.

In European countries goat's milk always brings a higher price than cow's milk, and because of this fact kids are often raised on cow's milk. This is not a difficult thing to do. An ordinary nursing bottle answers the purpose fully until the kid is old enough to drink. There might be some danger in this method of raising the kids if the milk should happen to come from a tuberculous cow, for it is possible for goats to contract tuberculosis, notwithstanding the statement so often made that they are absolutely immune from it; and there is no other method known, except inoculation, more likely to communicate the disease. If the cow furnishing the milk is sound, this method ought to prove very satisfactory.

If a nursing bottle is brought into use it should always be kept clean. Particles of sour milk, that otherwise will collect in the nipple, will clog the opening, and very often produces sickness in the kid.

So soon as the kids are old enough to eat they should be allowed some green feed. If leaves of trees or weeds are available the kids will snip them off, and thus secure a mixture of diet, which is quite essential; for goats of all ages soon tire of one kind of feed if it is given without change. A little later the kids will begin to eat grain. Oats are generally considered the best grain for the growing animals, although other grains, when fed with judgment, give satisfactory results.

The time for weaning will depend upon the value of the kids. Assuming that the kids are sucking, because they are worth more to the owner than the milk, they should not be weaned until they can do just as well or better on other feed. This time will be not less than three months from birth, and not over four months.

A kid is one of the most delicate animals known until it is two or three weeks old. It is frequently said by sheep men that "almost nothing" will kill a very young lamb; less than that will kill a kid. It must be kept dry, be kept warm, and be well nourished. A cold rain

upon a young kid is about as certain to produce death as a bullet through its body. Angora goat raisers find it very necessary to ascertain from the first whether the kids are getting nourishment in sufficient quantity, as the milk-producing qualities of that breed are uncertain; but with milch goats this condition should not arise. However, it is better to keep close watch for a few days in order to guard against any mishap. After the kid is two or three weeks old it begins rapidly to develop a hardy nature.

IN-AND-IN BREEDING.

By in-and-in breeding is meant the mating of individuals that are closely related to each other. This practice is one which the careless breeder is very likely to permit or possibly encourage, but he should know that, except in skillful scientific hands, it may result in goats of weak constitutions. If we are to have a hardy race of goats in this country we must avoid everything of whatever nature that has a tendency to weaken the constitution of the animals. One of the evils from which the Angora goat industry is now recovering was the in-and-in breeding that was extensively practiced until a very few years ago. Let the milch goat breeders profit by that mistake.

The purpose here is not to condemn in-and-in breeding altogether, for it has in some cases proved to be of great benefit; but its success depends so much upon a thorough knowledge of the principles involved—information which is not possessed by the great majority of breeders—that goat men are advised to avoid the practice. Some families of goats, as of other breeds of live stock, will endure in-and-in breeding better than other families. A family of strong milking goats, which will thrive under close breeding, would be especially valuable, because it could be multiplied pure without injury by the admixture of blood less efficient in milk production. Such blood would be useful as purebred milch stock, and the males would be likely to be prepotent sires to use in improving the remainder of the breed or in grading up from common stock.

HARDINESS OF GOATS.

The goat is a hardy animal; but it must not be understood by this statement that it is capable of withstanding all of the hardships for which it is so frequently given credit. In a playful way the press writers and cartoonists picture the goat as being always thrifty upon a diet of posters and tin-can labels, and show it in great happiness in a vacant lot that is entirely wanting in weeds and other vegetation. It is surprising but nevertheless true that some people believe such stories, if one may judge their beliefs by their actions. Thousands of Angoras have been starved to death in inclosures—so-called pastures—where there was practically no feed whatever. Apparently the animals

were expected to gnaw the bark from trees large enough for saw-logs and to gather leaves and twigs at a height of 10 feet and more.

The hardiness of the goat is ascribed to various causes, such as the large amount of exercise and fresh air that it gets in gathering its food, the great variety of food that it secures in thus wandering about, and its practical freedom from tuberculosis consequent upon the above conditions; but it can not maintain this hardiness without exercise, with little fresh air, or with little feed, and that of one kind only. There must be also a good shelter from storms easy of access at all times, and protection against extreme cold must be afforded in winter. Under the conditions first named in this paragraph the goat is likely to remain healthy; but it should not be assumed that it is not subject to disease. The same precautions should be exercised toward it that are accorded sheep.

After an experience with goats of various breeds, extending over a good number of years, I have been forced to the conclusion that these animals, under the conditions in which they are usually maintained in this country, are not the hardy creatures they are popularly supposed to be, and which I myself at one time thought them. No doubt in a wild or semidomesticated state on the rocks and mountains where they love to roam, and where they obtain the kind of food best suited to their requirements, these, like most other animals under similar circumstances, rarely suffer from disease. But housed in overheated and badly ventilated stables or pastured on rich, moist soil, this hardihood no longer exists, and goats become subject to some of the diseases common to sheep and cattle.—*Pegler.*

POINTS TO BE OBSERVED IN PURCHASING GOATS.

Aside from the technical points governing the selection of a buck or a doe, there are a few others that are worthy of consideration and they are discussed here.

If a registered goat is purchased, both the seller and the purchaser should be anxious to see that the transfer of the certificate is properly recorded with the registry association. This is usually done by the purchaser after the seller has turned over to him the certificate which he holds. The purchaser should insist upon this action. He should also obtain from the seller a copy of the pedigree of the animal. Of course, right now, when registration is just beginning, a pedigree will necessarily be very short, but the purchaser should have what there is of it. It is not necessary to discuss the value of pedigrees, but live stock men all know how important a pedigree is.

An animal is not necessarily a good one because it is registered; but its registration indicates that its sire and dam have been bred along right lines, and the chances are that it will be useful for the purpose for which it is bred.

There are some advantages in purchasing an old goat, say 5 or 6 years old. She will know better than a young one how to care for her kids; she will have become accustomed to the milking operation,

and probably she will give a larger quantity of milk than a younger animal. Besides, if a goat has once given milk, one has a pretty fair index of what she will do in the future. The purchaser should be on the alert in order that a goat may not be sold to him that is so old as to have passed all its days of usefulness. The teeth will show the age until the animal is 5 years old, but after that, in the absence of authentic records, dependence must be upon the judgment based upon general appearances. The condition of head and eyes indicates old age better than any other features. A goat is not to be considered old because it is thin in flesh, for this condition is a prevailing characteristic among milch goats. It is next to impossible to put any fat on one that is giving milk.

The purchaser should insist upon healthy animals. If he should get one that is sick he not only stands a chance of losing it, but the sickness may spread to all the others of the flock and finally result in total disaster. This would be especially true of the disease known as takosis, which is described in Bulletin No. 45 of the Bureau of Animal Industry. The animal selected should show spirit in eyes and ears, give evidences of plenty of blood, and be a hearty feeder. Condition as to fatness should not have much weight, but make sure that the thinness is not due to poor health. Ordinarily the bucks may be expected to carry more flesh than the does.

PRICES OF MILCH GOATS.

So far there has been very little dealing in milch goats in the United States, and therefore no really definite price. It is evident there will be as many different prices as there are different kinds of goats. The common American goats can be purchased at this time, if one is so fortunate as to find them, at \$2.50 to \$10, while no prices have been made upon any of the purebred animals. The basis of the price to be paid must depend upon the value of the animal to the purchaser, and in such a case the purchaser himself is the best judge.

The best milkers of Malta sell at \$18 to \$25, while the various breeds of Switzerland bring about \$20 each. In Syria and Egypt they may be had for a price as low as \$4 each. In England prices are very much higher. A very fine milker in the latter country will sometimes bring as much as \$40; if a pure Toggenburger, the price is more apt to be \$100 or more.

WHERE TO PURCHASE GOATS.

"Where can I purchase milch goats?" That is the question that has often been asked of the Bureau of Animal Industry, and it will probably be repeated a thousand times more. The difficulty is that a definite and entirely satisfactory reply can not be given; but it is proposed here to give the best information at hand for the benefit of pros-

pective purchasers. At this time, right at the beginning of a new industry here, it is, of course, not expected that there are anywhere large flocks to which correspondents may be referred; and if such flocks are brought together very soon they must necessarily be of the common stock. With only about a score of purebred does in the country at this time we can not hope for a sufficient number of kids very soon to supply the demand for animals of pure breeding. It is the purpose of the owners of these purebred animals, however, to keep the blood pure through the imported does and to use the pure bucks to the fullest extent practicable upon selected American does. This method should soon produce a considerable supply of grade kids of considerable value.

It is obvious that for a time those who desire to purchase milch goats will have to depend principally upon the common American stock, and these animals will be found generally in the suburbs of the larger cities, where sometimes as many as half a dozen may be found in a flock. In the Southern States a considerable number will be found here and there on farms, especially upon those farms tilled by colored people.

Occasionally there are Angoras that give a large quantity of milk, but they are not numerous. The milk of the Angora is equal in quality to that of any of the milch breeds, and some analyses indicate its superiority over all of them.

LENGTH OF A GOAT'S LIFE.

Goats have been known to live to be 16 years old, but such instances are rare. The average length of a goat's life is probably about 12 years; and, in the case of does, if they have been well cared for during all of their lives, they may produce kids until that age, but the ability to produce milk is greatly diminished. Under the ordinary conditions of goat raising, an animal is in her prime when from 5 to 7 years old. If one should possess an exceptionally good doe, one which transmits her good characteristics to her offspring, he would have a doe worth his while to keep till old for breeding alone.

The buck's period of usefulness depends more largely upon his care than that of the doe. If not managed with good judgment, his vitality is liable to be exhausted before he becomes very old. If he is kept vigorous by good feed and put to service rationally, he should be yet a good getter at 10 or 12 years of age.

HOW TO DETERMINE THE AGE.

It is not a difficult matter to determine the age of a goat until after it is 4 years old. The accompanying illustration (fig. 3) from Bryan Hook is very helpful to an understanding of this matter. During the first year of a kid's life its teeth are small and even and sometimes separated, as shown in the illustration; the second year shows the two

front teeth as being much larger and higher; the third year adds two more large teeth; the fourth year, two others; and the fifth year, two others yet, which completes the set. After this time the only way to know a goat's age is from records that may have been kept; but one may form some judgment of its age by its general appearance.

GOAT'S FLESH AS FOOD.

There is a prejudice in most countries against goat's flesh as food. This is the outgrowth of experience with common and milch goats, the flesh of which, from mature animals, is tough and often of strong flavor. In some parts of Asia, especially in Asia Minor and Syria, the goat, however poor its flesh may be, is the only economic source of fresh meat, and many are used there in this way.

The kids are everywhere considered a table delicacy. There is in the meat none of the unpleasant features of that from the older animals, and it is generally said to be superior in flavor to lamb. They should be slaughtered for eating when from one to three months old. A correspondent of this Bureau, in writing of the goats kept in the Italian settlement at Palisades Park, N. J., states that the kids, when dressed at eight weeks old, sell readily at \$3 to \$5 each. Of course, this locality is near the largest and best market of the country, but the delicacy of their flesh ought to insure a ready market anywhere.

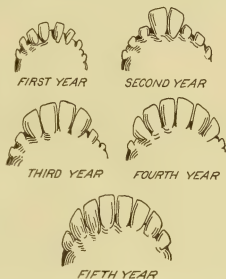


FIG. 3.—How teeth show the age of goats.
(Copied from Bryan Hook.)

THE SKINS.

The skins of milch goats are of better quality than those of the Angora breed, and are the kind used in the manufacture of shoes and gloves, and those from the colder parts of the country are better than those from the warmer parts. Inasmuch as the United States imports millions of dollars' worth of goatskins annually, it would seem that there should be a ready market for all that might be produced here. It is estimated that the skin from a kid of two months is worth when dry about 25 cents.

Probably most people who handle goats know how to care for the skins, but for the benefit of those who may desire information on this point the following is copied from Pegler:

The operation of flaying should be performed as soon after the death of the animal as possible, for if it be delayed any length of time the hide may deteriorate in quality; this is sure to be the case if the goat dies from disease and has been left until decompo-

sition has begun to take place. To remove a skin properly requires some skill and care, so as not to cut it with the knife, and at the same time leave as little flesh and fat attached to it as possible. Those who are inexperienced in such work had better employ their butcher's slaughterman, who for a trifle will kill, flay, and cut up their goat in a workmanlike manner. When the skin has been taken off, all the bits of flesh and fat adhering to it should be carefully removed with a knife, and the hide placed to dry, the hair side inward, in a covered, airy place free from damp. To prevent it from shrinking the head and tail ends should be stretched out and nailed on a board, and the leg parts spread out with skewers. Skins are sometimes preserved with salt and dried afterwards, but salt should not be used where it is intended to convert them subsequently into leather, as it never becomes thoroughly eradicated. The process of salting consists of laying the skins flat on the ground and well sprinkling the flesh side with salt and alum, more particularly on the edges and spinal portions. They are then folded by being doubled, first lengthwise down the center, and then one fold over the other until a square is formed; they will keep good in this manner for a considerable time, and may be dried afterwards.

MILCH GOATS AS BRUSHWOOD DESTROYERS.

The pronounced habit possessed by Angora and common goats of eating brushwood and weeds in preference to any other feed is well known, and the thought will doubtless occur to many people that milch goats have the same predilection; and, indeed, they have. Whether or not brushwood is the best feed for them is a question that should be considered. German writers on the subject of milch goats discourage the practice of some of allowing the goats to browse largely upon brushwood. They contend that the twigs and leaves not only have a tendency to impart an unpleasant flavor to the milk, just as in the case of cows, but lessen the milk supply and shorten the period of lactation. In foreign countries the goats wander along the roads and up the mountain sides and gather whatever feed may be accessible, but only a small percentage of their food is brushwood.

In this country the case will probably be that the feeding grounds will usually contain some brush and a small amount will hardly do harm; on the contrary, a little brushwood browse will serve as a tonic and thus help to ward off disease. The act of browsing furnishes exercise—something which is an absolute necessity. However, it would not be well to place goats giving milk in pastures where they can have their fill of leaves and twigs, even if the temptation to do so is strong. Milch cows are not profitable under such conditions, and there is no reason why goats should do any better than cows. There are always kids, however, and the brushwood pastures would prove a most excellent place for them; there they would thrive under the most favorable conditions.

The proper feeding of milch goats is discussed elsewhere in this article. (See p. 34.)

THE MATTER OF FERTILIZER.

It has been estimated by careful observers that the value of the manure produced by one sheep, in regions where manures are purchased at commercial prices, is \$3.30 per year. There is no special difference between the manure of the sheep and that of the goat, except that the latter animal produces more of it. But it will depend upon circumstances whether this average of \$3.30 per head is actually realized. If the goats remain upon rocky hillsides or in a stony pasture both day and night, very little good will result from the fertilizer; but if they are confined in a house at night or in a small inclosure where the manure can be collected and saved, or if they run upon land that is later to be used for the production of vegetables, grain, or grass, it will prove to be very valuable. The influence of a very few animals is felt over a considerable area of land. There is a permanency in the effect of such manure upon the land that can not be obtained from commercial fertilizers, yet many farmers waste barnyard manure and pay high prices for the latter.

Angora goats have been given much well-deserved credit for destroying the brushwood and weeds upon valuable land and at the same time depositing upon the land a good coating of fertilizer. This clearing and fertilizing, aided by the sun's free access, have caused fields of blue grass to spring up where only weeds and bushes grew before. Milch goats will not do less if the opportunity is afforded them. But it must be borne in mind, as elsewhere mentioned, that much browsing is likely to have a bad effect on both the quantity and the quality of the milk.

HORNS OR NO HORNS.

Some German writers make strong claims, without specifications, however, for goats without horns, but a study of the matter seems to show that as between the horned and hornless varieties there is no difference in the amount of feed required or in the quality and quantity of the milk produced. The hornless varieties are not so likely to do injury to each other when running in flocks as those bearing horns, and in this respect are desirable. It is the opinion of this writer that the presence or absence of horns has no influence upon the value of the goat as a milk producer, but it is granted that the horns are a nuisance and of no value to the animal except as a weapon to be used against dogs. In forming new breeds or subbreeds it might be found, not only possible, but very desirable to breed hornless types.

WATTLES ON THE NECK.

The processes, or appendages, two in number, attached to the under side of the neck of many goats occasion no little comment regarding

their significance. Some have a notion that the presence of wattles indicates pure breeding or a large infusion of pure blood. This is not the case, however, as many of the most useless common goats have them, while some purebred milch goats do not have them. Wattles are not confined to goats. Many people are familiar with a peculiar kind of hog which was numerous in the Indian Territory twenty or more years ago that had wattles very much like those on the goat. So far as the writer knows these processes signify nothing and have no function.

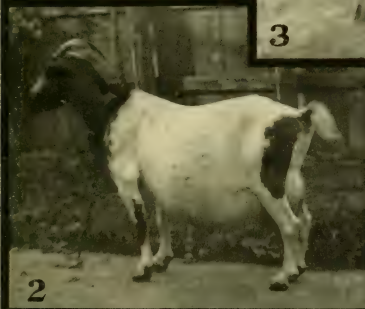
WORRYING BY DOGS.

Dogs do not worry goats to the extent that they do sheep; but the failing is not with the dogs. The goat is better able to take care of itself and is more inclined to do so. However, it will never be entirely safe to expose kids where there are worthless curs in the neighborhood, for this is the class of dogs that usually worries sheep. It is not often that a well-fed dog of good blood is guilty of worrying sheep. Kids are not able to care for themselves. Grown goats will offer fight, and a sheep killing dog never wants to encounter any other animal that fights; and yet a hungry dog may do considerable damage to a goat that offers fight. Whoever is familiar with the common goats that are so often found about livery stables has observed that dogs always give the goat the right of way; these goats have been trained to fight, and this has made them masters. A goat does not need much training to make him fight a dog, and this little should be given to a buck for the benefit of the whole flock.

IMPORTATIONS AND IMPORTING.

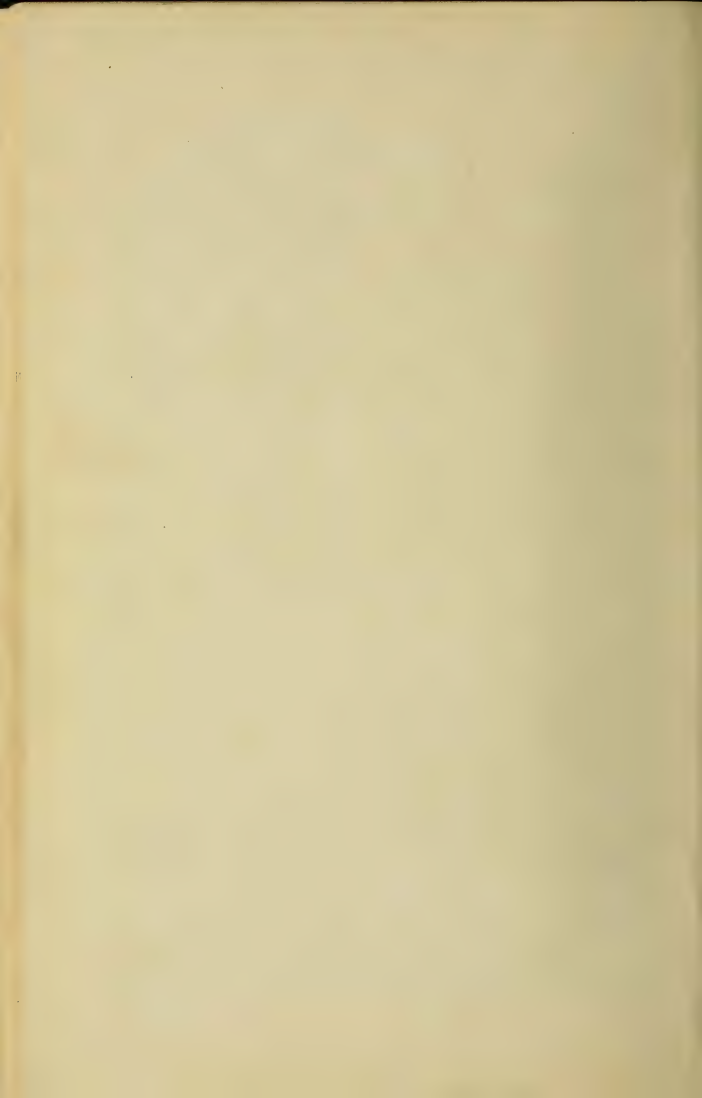
We shall never know how many goats have been landed upon our shores from foreign countries previous to the establishment of strict quarantine by the Department of Agriculture; but in the aggregate there must have been quite a number, since they came as mascots of sailing crews; and, too, immigrants were sometimes successful in landing with kids in baskets. However, there appears nowhere to have been an effort to keep the blood of any such animals pure, and any virtue that there might have been in any of the breeds imported was soon dissipated in the numerous and indiscriminate crosses that followed. It is not likely, however, that any such animals were of the leading milk breeds, such as those of Switzerland, Malta, or North Africa. They probably came, rather, from Italy, the West Indies, South America, or the British Isles.

The real record of importations of milch goats into the United States begins with the date of July 11, 1893, when W. A. Shafor, Hamilton, Ohio, who is secretary of the American Oxford Down Record Asso-



AMERICAN MILCH GOATS.

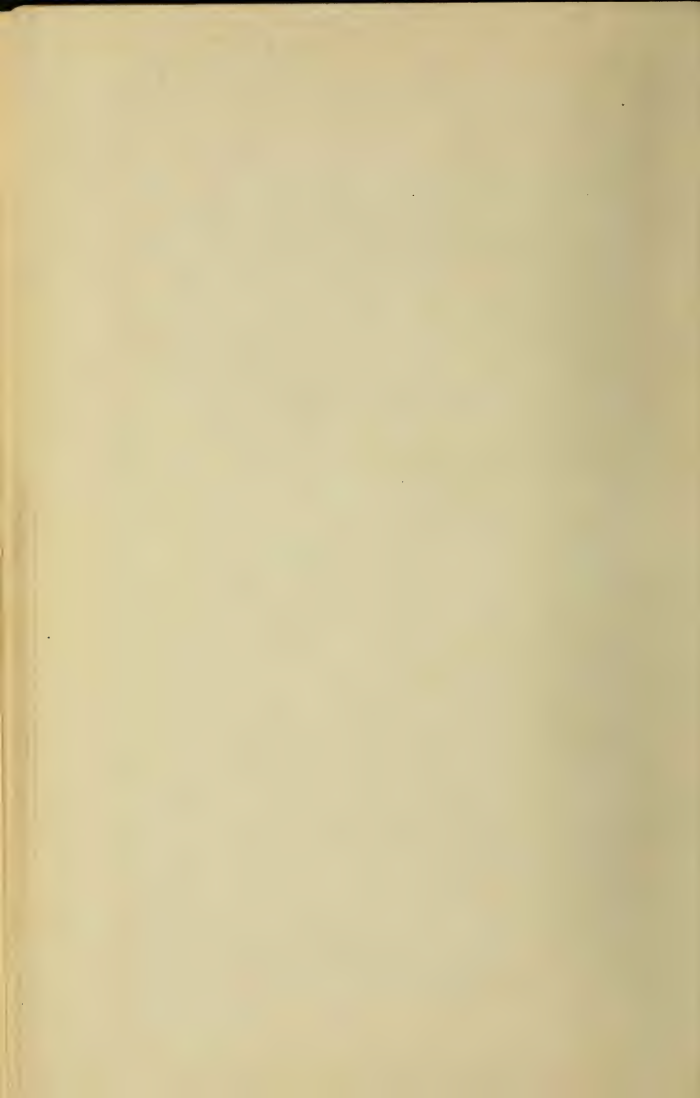
Photographs furnished by Mrs. Edward Roby and Dr. Wm. More Decker.





QUEENSLAND MILCH GOATS.

Photographs furnished by J. R. Christolm, Queensland.





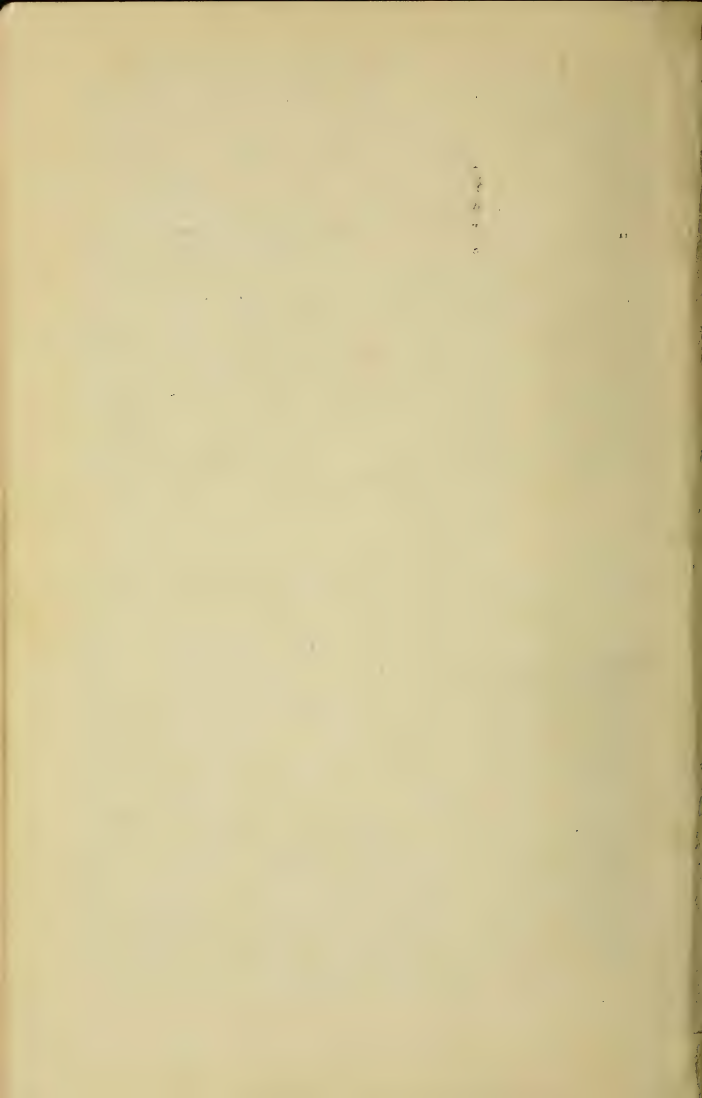
AMERICAN MILCH GOATS.

Photograph furnished by Wyatt Carr, Iowa.



AUSTRALIAN GOATS.

Photograph furnished by H. Hocking, Australia.



ciation, and also secretary of the American Milch Goat Record Association, imported 4 Toggenburgers which he purchased in England. Owing to many adversities, not of sufficient importance to recount here, these animals did not thrive, and at this time only a few head remain.

The second importation was made by William J. Cohill, Hancock, Md.; Robert N. Riddle, Carteret, N. J.; William More Decker, Buffalo, N. Y.; and S. King Bayley, Westwood, Mass. These animals were personally selected in Switzerland by F. S. Peer, all coming through the Canadian quarantine. They arrived in the United States May 25, 1904. This importation consisted of 16 Toggenburgers and 10 Saanen. They had a hard voyage and consequently arrived in very poor condition. Five have since died, but the death of 3 of these resulted from accident. The remainder of the importation is now reported to be in excellent condition.

It is necessary to record here another importation (date unknown) of two milch goats from the Black Forest of Germany (usually regarded as Swiss goats), now the property of William J. Cohill, of Hancock, Md. These animals he secured from Carl Hagenback, at the World's Fair, in October, 1904. The breed to which they belong is not definitely determined, but, as elsewhere stated, the writer is of the opinion that they are of the Schwarzwald breed. As both of the goats mentioned are does, and there are no others of the kind in the country, so far as known, the breed can not be perpetuated pure under present conditions. A picture of one of Cohill's goats of this breed is shown on plate 7, figure 3.

REGISTRATION.

The American Milch Goat Record Association was organized on November 12, 1903. It came into existence for the sole purpose of encouraging the establishment of a milch goat industry in the United States. Recognizing the difficulties to be encountered in importing purebred animals from Europe and Asia, the founders of this association decided to admit animals upon a very liberal basis. It was evident that the foundation stock of this new industry, with very few exceptions, must be selected animals from the nondescript varieties already in the United States. Therefore it was decided that the chief qualification for registration in this association should be that the doe shall yield at least 2 quarts of milk per day. The period of lactation to be required has not yet been determined upon.

This association registers all breeds which have the proper qualifications, and under this registration the animals are known as American milch goats, a proposed breed which is discussed on the next page following.

As there are now in the United States a few head of purebred Toggenburg and Saanen goats, every effort should be made to keep them pure; and, although they are registered as American goats, a separate register for each of these breeds has been started and all the importers have registered their stock in them.

Further information regarding registration may be obtained from W. A. Shafor, secretary of the American Milch Goat Record Association, Hamilton, Ohio.

BREEDS OF MILCH GOATS.

The goat was probably one of the first animals to be made to subserve the interests of man, yet no other domestic animal has been bred so aimlessly and so carelessly as it has been. It is found in all parts of the world, and the varieties are so numerous that no effort has been made at any time to classify them into breeds. The purpose in this work is to mention but a few, and these of the milk-giving type. It must not be understood that this list mentions all of the kinds of milch goats, but those only which have been developed most highly for milk production. Only a few of the Swiss breeds are described, although Anderegg is authority for the statement that there are in Switzerland not less than sixteen pure breeds of goats. It appears that each valley there has its own distinct type of goat and the resident of no valley has any desire to import a variety from another valley, no matter how beneficial this might prove to be, and, indeed, his own valley people would resent such action.

The descriptions which follow are almost wholly from German writers on goats. The breeds that are represented in the United States are the Toggenburg, the Saanen, and the Schwarzwald. The other breeds are mentioned in order to give such information as is at hand for the benefit of those who may desire to know something about them.

The American goat.—This is a name which has been suggested for the breed which it is desirable to develop by selection from the so-called common goats now in this country. It is known that among these goats there are often found some excellent milkers, although their origin is obscure. We are told that some of the Italian immigrants have frequently brought with them from the old country very young kids in baskets. These were cared for as one of the children and among the children, and they have no doubt grown up and exerted a considerable influence upon the general average of the milk supply in the neighborhoods to which they were taken. Other good milkers are said to have been brought from Bermuda, and this blood has probably had its effect also. We should not be surprised, then, when we occasionally hear of a goat that will give from 1 to 2 quarts of milk

daily. Very recently this Bureau has been informed by a business man of New Jersey that there is a large number of goats kept in the Italian quarter at Palisades Park, and upon special inquiry he learns that the average amount of milk produced, so far as an estimate can show, is 3 pints per day. This milk retails among the Italians at 12 cents per quart; and butter is also made there from goat's milk to a limited extent which sells at retail in New York City at 30 cents per pound.

These are the kind of goats that should be selected as a foundation for the American breed, and if their milk characteristics were further increased by crossing with either the purebred Toggenburg or Saanen bucks which are now in this country, we should soon see a breed that would produce a satisfactory amount of milk and at the same time have all of the hardiness possessed by our common goats.

Some work along the lines suggested has already been done in various places, and occasionally a very good milker is produced. One of these animals showing excellence is Watita (pl. 1, figs. 1 and 2). When this doe was fresh and on green food, she "gave almost a gallon of milk per day," to quote her owner's words. The illustration, which is furnished by Mrs. Edward Roby, the owner, of Chicago, Ill., shows the doe at $3\frac{1}{2}$ years old and 3 months after her second kidding. At the first kidding of the doe she dropped four kids and three the second time. Her conformation and record show her to be a very desirable animal as one of the mothers of the American milch goat.

Two similar animals are Bluebell and Mrs. Cotton (pl. 1, figs. 3 and 4), photographs of which are furnished by Dr. William More Decker, the owner, of Buffalo, N. Y. A glance at the picture of the former shows her to be much above the ordinary goat, while the latter shows some of the markings of the Toggenburg breed. Bluebell is 5 months old, bluish gray trimmed with black, and the hair noticeably soft. Her mother produced a good quantity of milk that was of very high quality.

The writer is indebted to J. R. Chisholm, of Queensland, Australia, for the photographs of the row of milch goats shown by plate 2. This gentleman states that there are in his country large numbers of such goats that will yield 3 quarts per day. They are not purebred animals, and, so far as is known, they have no blood of any of the pure breeds. The animals shown in the illustration indicate what is possible for American breeders.

The Maltese goat.—This well-known breed of goats is, as the name signifies, from the island of Malta, in the Mediterranean Sea. The island comprises but 95 square miles, and its population at this time is about 200,000. There are kept on the island, however, about 30,000 goats (among which are enumerated a few sheep) for milking

purposes, while the number of cows is only about 900. There are no pastures there. David G. Fairchild, agricultural explorer for this Department, notes that the goats are fed on scraps of all kinds, such as they may be permitted to pick up on the streets, where they usually wander about in small droves. This habit of subsistence is certain to give to the milk an unpleasant flavor, and it is not a matter of surprise that the English contingent of the population prefer condensed milk from England or the United States. "Their milk has the usual strong taste," says Fairchild, "but is drunk either alone or with the morning coffee by many Europeans regularly, and one soon becomes accustomed to it."

The proper winter food for the Maltese goats is the chick pea, broad bean, and sulla, all of which are grown all over the rocky island. In summer they obtain much feed from the leaves of maize and prickly pear.

The hair of this breed is long, the color being white and reddish brown or black. Hook says, referring to those which have been imported into England, that "the color is almost invariably white, with more or less red markings."

The Maltese goat is usually hornless, but the presence of horns is not an uncommon sight. The legs are short and the body compactly built. The ears are moderately long and are horizontal. The udders are large, oftentimes nearly touching the ground as the animal walks.

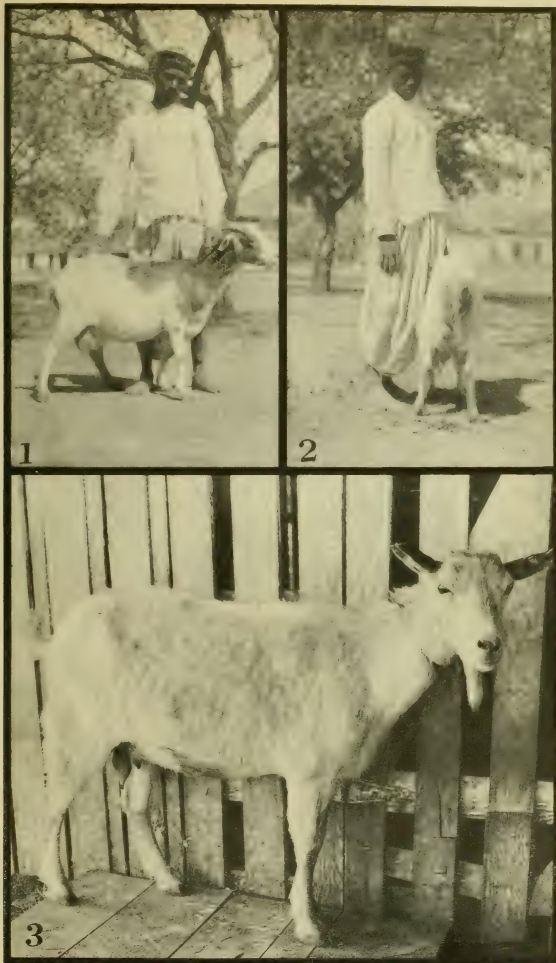
Hook says that it is quite difficult to acclimatize them in England. The weather appears to be too cold and wet. The real injury is probably due to the wet cold rather than to the cold alone, for they have hair enough to protect them against ordinary cold. We know that no dry cold is too severe for the Angora, but a little wet cold often causes death, and probably the Maltese is influenced in the same manner.

The same difficulty of acclimatizing would no doubt be encountered in some parts of the United States, but Fairchild, who is familiar with the climate of Malta, says:

It is my opinion that, with proper attention to the matter of feeding and a consideration for their social habits, this breed of goats might be introduced into southern California with great advantage. They could possibly be substituted for the wild breed which now overruns the rocky islands off the coast near Santa Barbara.

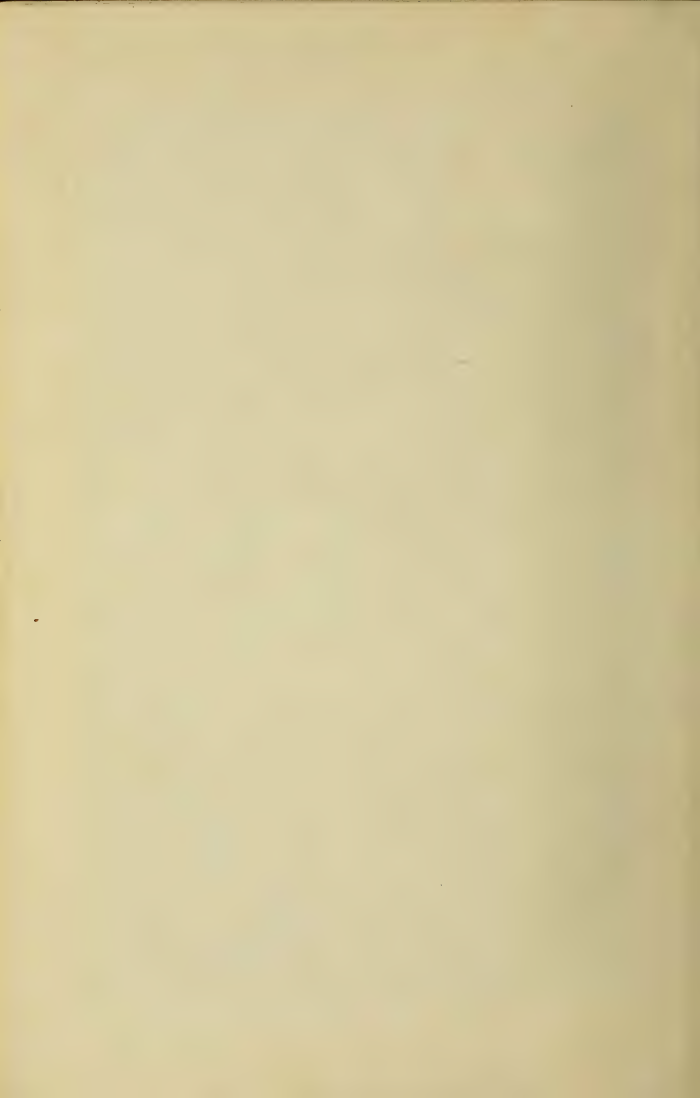
There is a prevalent idea on the island of Malta that the Maltese goat does not do well when transplanted to the mainland, but the idea is a mistaken one. This breed of goats when raised in Tunis, for instance (pl. 6, fig. 2), is in every way equal to those raised in Malta. Fairchild's observation was that the goats thrived as well and the udders were as fully developed in Tunis as in Malta.

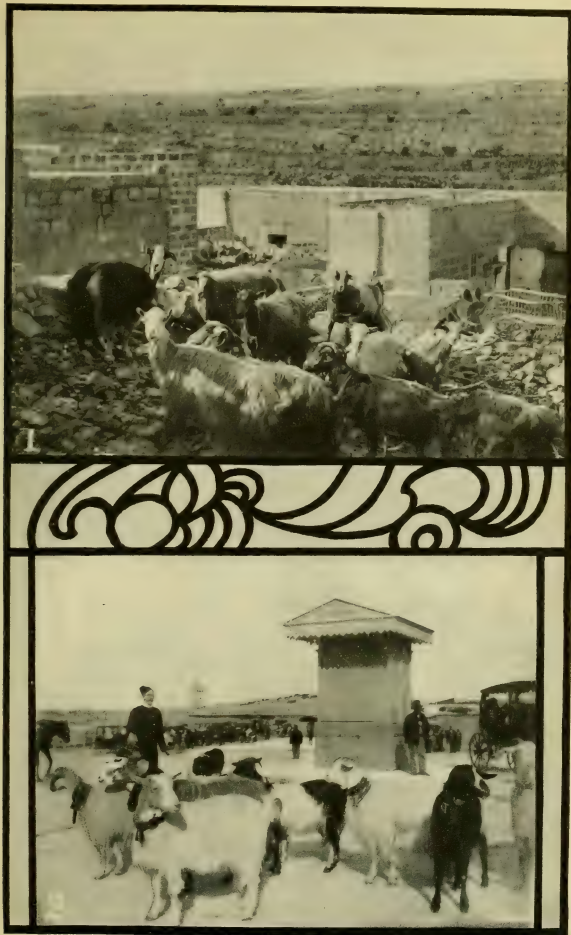
Whether or not the Maltese goat will thrive in any part of the United States is a matter for the future to settle, for no animals of this breed



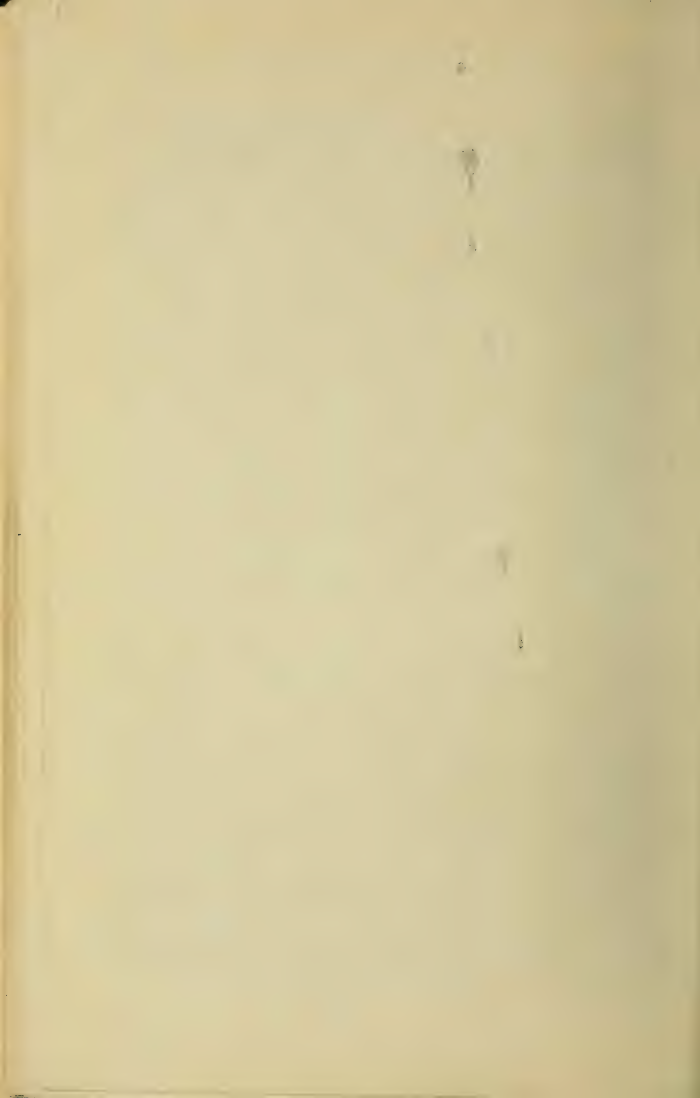
FIGS. 1, 2.—POONA (INDIA) GOATS. FIG. 3.—SPANISH-MALTESE GOAT.

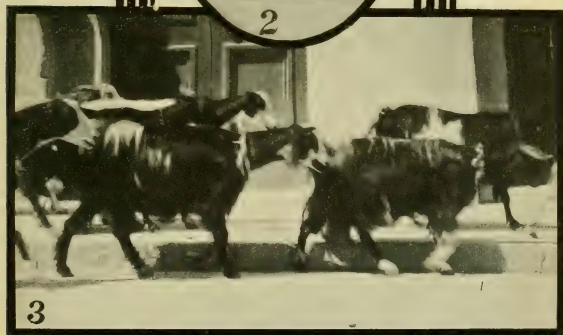
Photograph of first two furnished by David G. Fairchild and of the last one by B. H. Van Raub, Texas.





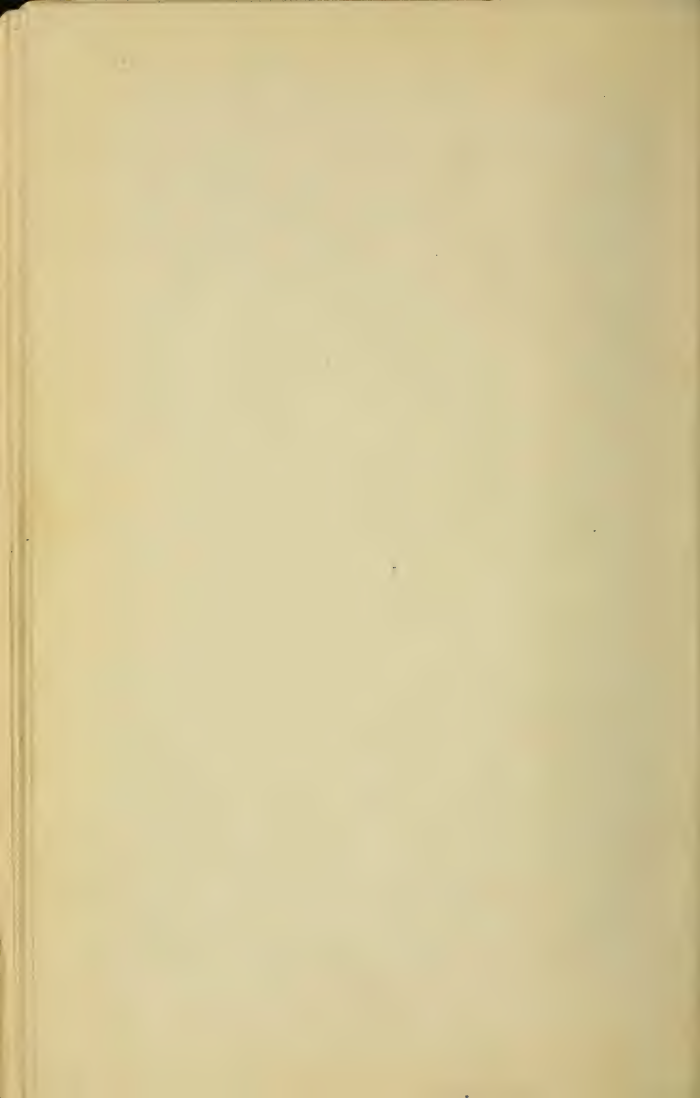
MALTESE MILCH GOATS.
Photographs by Sallie Russell Reeves.





MALTESE MILCH GOATS.

Photographs by Sallie Russell Reeves and David G. Fairchild.



have ever been imported. If a warm climate is necessary, our entire South and Southwest would undoubtedly prove adaptable. All long-haired goats now in this country thrive well in the cold sections, if they are not exposed to wet cold, and it is confidently believed that the Maltese, having long hair, could soon be acclimatized. The long-haired Mexican goat finds no difficulty in surviving the cold of our Northern States, and the Maltese may prove itself as hardy. A few years ago a few head of Maltese goats were imported into Canada, and it is reported that they are there fulfilling all expectations.

It should be stated in this connection that this breed is entirely different from the Spanish Maltese goat, which is discussed hereafter.

With reference to milk production, the Maltese goat is among the best breeds. They have been bred so long in Malta for the single purpose of milk production that most of the does are good milkers. This feature is more constant among them as a breed than among the Toggenburg or Saanen breeds. The period of lactation is a long one, and the quantity of milk given is from 3 to 4 quarts daily.

The milk vendors in this island drive their animals along the street from door to door, and draw the milk as it may be required by the purchaser. The man or boy having the goats in charge squats behind the animal and draws the milk into a cup.

The Toggenburg goat.^a—This breed is called the aristocrat of the milch goat family. There are some breeds that are more hardy perhaps, some that are more prolific, some that will show occasional individuals of greater milk production, and several that present a more robust appearance, but the Toggenburg seems to combine in itself more of these characteristics in high degree than any other breed.

This breed is from the Toggenburg Valley, a district forming a considerable portion of the Canton St. Gallen, in the northeast section of Switzerland and about 70 to 100 miles from Berne. Here they have been bred for centuries.

The color of the animal is brown (not dark brown), with a white bar down each side of the face, which may easily be seen in the accompanying illustrations (pls. 7, 8, and 9). The legs, below the knees and hocks, are light gray or almost white. There seems to be a general understanding throughout the Toggenburg Valley as to the markings and general characteristics of these goats, except as to the length of the hair. There are long-haired and short-haired Toggenburgers, and some breeders select the one kind as being more hardy and some the other kind, disputing the greater hardiness of the long-haired ones. Peer says: "Where I found in one flock Toggenburgers having long,

^aThis description includes that of Mr. F. S. Peer, who visited the Toggenburg Valley early in the year 1904.

medium, and short coats, I was not able to get a positive answer that one was hardier than the other." All agree, however, that the coat, whether long or short, should be thick and fine.

Notwithstanding the lanky and lean appearance of these animals, the does are quite attractive. The bucks have a harsh and most serious expression, owing principally to the shape of the head and the large, coarse beard. They are not given to fighting, however, and are free to a large extent from the odor that is generally so objectionable in males among most other breeds of goats.

The udder of the Toggenburger when distended is carried high between the legs. The teats are usually very large and long.

The Toggenburg is generally called a hornless breed, but instances are not uncommon where horns are developed. Peer states that he did not see a specimen having horns in the Toggenburg Valley, owing no doubt to the custom prevailing there of weeding out those that develop horns. And he further says that "among the animals of this breed selected by me for importation to the United States, one gave birth to a female kid that developed a perfect set of horns, which by the time she was 3 months old were fully 5 inches long." It is remarkable that at this writing (December, 1904) only one other kid from this importation has been born, and it, too, like the one Peer mentions, has horns.

The breed is somewhat slender, and one of its principal characteristics is its great leanness. Except for its greater size, it much resembles the Appenzeller; indeed, Hook, referring to the peculiar coloring and deer-like shape of the Toggenburger, says the facts suggest the possibility of its being a cross between the Appenzeller and the chamois, which abounds in that section of Switzerland. Peer says the opinion is general among the Swiss peasantry that the Toggenburger is the result of such crossing; and, while he believes this is extremely doubtful, he mentions a kid having "as perfect a pair of horns as ever was seen on a chamois." It may well be doubted if any cross of the kind was ever produced. The ears are pricked usually, but sometimes held in a horizontal position, and are of moderate size, as is the case with all Swiss varieties.

In discussing this breed, Hook points out an important feature which is applicable to all breeds, namely, that the high position occupied by the Toggenburgers as milk producers has been attained by the careful selection of individuals for breeding, and from their offspring, preserving those only for breeding which have proved themselves to be good milkers. This practice can not fail to lead to definite results if the selections are made intelligently. The Toggenburgers are especially noted for their great milking qualities, and in this particular they probably excel all other breeds, unless the Nubian is excepted. In Switzerland there are a goodly number of the more intelligent breeders

of these goats who are breeding only the best milkers. These goats give from 4 to 5 quarts a day, as a rule, while the best produce from 5 to 6 quarts, and, in extraordinary cases, as much as 7 quarts per day. Their persistence in giving milk is a noteworthy characteristic. Some of those that were imported last May (1904), and which were in lactation for the first time, are still giving milk (December, 1904), and will probably continue to do so until they are "dried off" by their owners. And yet they were carried from place to place in Europe before being placed on shipboard at Antwerp, then a sea voyage covering much more than the usual time before reaching Canada, and finally three days by express (without being milked or fed apparently) to their destination.

This breed can probably be acclimatized in the United States without difficulty. They will fare better in the mountainous sections than in the lowlands, and whenever they are taken to the lowlands they should be kept strictly away from marshy places, else their hardiness will soon disappear. Hook's observations on the Toggenburger in England are contained in the following:

The Toggenburg goat is, in my opinion, by far the most valuable and the best suited to our climate of all the pure breeds that have been introduced into this country, and, having now become fairly common and well established with us, is the breed I should unhesitatingly commend to the attention of goat keepers.

The Saanen goat.^a—The Saanen breed (pl. 10) takes its name from the Saanen Valley of Switzerland, which is about 70 miles southeast of Berne, where they are quite numerous; but they also abound in the Upper Simmen Valley. The Saanen is the largest breed of Switzerland; it is quite tall and lean and lanky, like the Toggenburgers. Its color is pure white or creamy white. The hair is short, except a strip along the spinal column and down the flanks and on the lower part of the thighs.

The Saanen does are especially beautiful, with slim, long, graceful necks, and clean, breedy looking heads; the head of the buck is decidedly masculine, but does not have the serious expression of the Toggenburger. The breast is well developed; as a rule, the udder is very pretty and carried high. This is considered a hornless breed, but, as with the Toggenburgers, occasionally one is found with horns.

Germany imports many of this breed, especially of the males, in order to cross them upon the German farm goat, and the resulting improvement has been very pronounced. In 1893 it is said that several thousand head were taken out of the Saanen Valley. Notwithstanding this fact, the German writers are very careful to warn prospective importers that the breeders of Saanen goats in Switzerland are never inclined to sell their best milkers and that there are likely to be

^a This description includes that of Mr. F. S. Peer, who visited the Saanen Valley early in the year 1904.

a large number of very poor milkers, which they do sell to anyone who will buy. In other words, while the name of this breed means much for some individual animals, it also means that the name is not a guaranty of high merit. Peer says:

As compared with the Toggenburg family, my observations lead me to say that, as a family, there are probably more large milkers among the Toggenburgers than among the Saanen, but that the best of the Saanen goats are superior to the best Toggenburgers. In other words, taking a given number of each breed as they come, I would expect the Toggenburgers to show the largest total yield, but among the best of each breed, I would expect the Saanen to win.

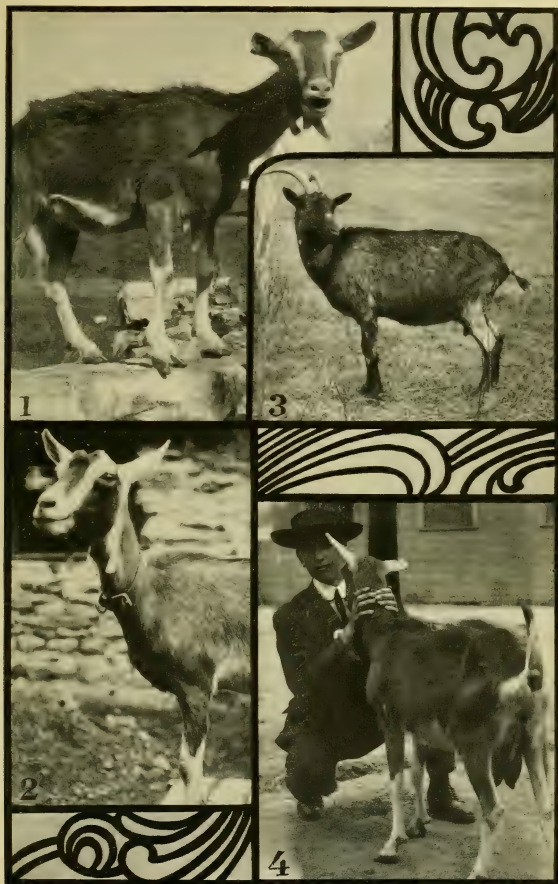
Doctor Kohlschmidt, director of the agricultural school at Freiberg, Saxony, conducted experiments in 1896 and 1897 with various goats to test their capacity for milk production, and one of his conclusions was that the Saanen goats, which had been imported into Saxony in 1894, with the same feed and methods of keeping that the Saxony goats had, could not be classed as anything better than the Saxony goats, as regards both quality and quantity of milk. Dettweiler speaks of Saxony as a place "where no one bothers himself about the goat," and therefore we have the right to infer that the Saanen goats which entered into Kohlschmidt's test had not been selected for importation with that care which is pointed out by most German writers to be so necessary. However, if the Saxony importations of 1894 were selected without much care, they proved to be fair milkers, as we shall see by the records below, and the Saxony goats that equaled their yield were excellent for common stock. In Kohlschmidt's experiment ten Saanen goats were employed—seven of them 3 to 3½ years old, and three from 2 to 2½ years old. The average quantity of milk produced during the year by these ten goats was 678.41 liters, and the smallest production was 421.94 liters. The following statement shows the annual production per head:

2 gave over	400 liters (423 quarts).
3 gave over	500 liters (528 quarts).
1 gave over	600 liters (634 quarts).
2 gave over	800 liters (845 quarts).
2 gave over	900 liters (951 quarts).

Animals of this breed which were fourteen months old gave an average during their first lactation of 509.72 liters per head per year. The maximum was 665.69 liters and the minimum 351.31 liters.

Wilsdorf says that Saanen goats, for a time after kidding, give from 4 to 6 liters of milk per day, and that "this yield happens not occasionally, but, as a rule, in the Saanenthal;" and Peer says "the best of them are probably the best in the world, giving from 5 to 6 quarts per day of the very best quality."

Neither Pegler nor Hook mentions any specimens of the Saanen breed in Great Britain, and it is not likely that there are any there.



FIGS. 1, 2, 4.—IMPORTED TOGGENBURG GOATS. FIG. 3.—SCHWARZWALD GOAT.

Photographs furnished by Wm. J. Cohill.



TOGGENBURG GOATS IN SWITZERLAND.

Photographs by F. S. Peer.



IMPORTED TOGGENBURG GOATS.

● Photographs furnished by S. King Bayley, Massachusetts.



SAANEN GOATS IN SWITZERLAND.

Photographs by F. S. Peer.

Several head came to the United States in the Peer importation in May, 1904, and so far they seem to be acclimatizing very well. With rational treatment they will probably do well in any part of the country, but especially in the mountainous sections.

The Appenzell goat.—This is another Swiss breed. It shares with the Toggenburger the right of possession of the Toggenburg Valley, where both breeds are raised side by side. As the Government grants a subsidy to these breeds when kept pure, but never does so when crossed, they are seldom allowed to interbreed. The Appenzeller is a good milker, and is considered inferior only to the Toggenburger and Saanen. It is often mistaken for the latter, especially in the case of those that are pure white. Some of them are, rarely, dark or spotted.

The Appenzeller weighs about 110 pounds. Its head is flat and hornless. One of the strong claims made for it is its great hardiness. It is easily acclimatized. In Switzerland many are kept in stables.

Anderegg is authority for the statement that the Appenzeller produces $3\frac{1}{2}$ liters of milk per day.

It is said that the results of crossing this breed with either the Toggenburg or Saanen breeds are always negative.

The Schwarzthal goat.^a—This breed, sometimes called the Glacier goat, or the saddle goat, belongs to Canton Valais, of Switzerland, and is specially numerous in the Rhone Valley. The frontispiece of Hook's "Milch Goats and Their Management" is a picture of several of these goats in the Rhone Valley. It is a large animal, having legs and horns resembling the chamois and a tuft of long hair on the forehead. It is a very striking animal because of its size and its coloring. The first third of its body, including the head, the neck, and the breast, is black, while the remainder of the body is pure white; these colors meet just back of the shoulders. The front hoofs are black and the hind ones white or yellow.

This is one of the hardiest of the breeds, if not the hardiest, as it withstands exposure better than any other of the goats of Switzerland or France. Because of this hardiness principally, but somewhat on account of its peculiarly striking colors, it is selected for export to Holland, Germany, Norway, and Sweden.

Another peculiarity of this goat, according to Pegler, is that "it almost invariably has but one kid at a birth," though it yields a large quantity of milk.

The quantity of milk given by this breed is not equal to that yielded by the other principal breeds of Switzerland, and the quality is also inferior. The following is from Hook:

Very large herds are to be seen on the Engadine and Reider Alps. At the latter place I once chanced upon a herd just as the herdsmen commenced the evening

^a This description includes the observations of Mr. Peer.

milking. There were two milkers, and as each goat was finished a young assistant caught and presented another, and the whole herd of fifty or sixty animals was milked in a remarkably short time, the produce being carried in one of the upright tubs upon the herdman's back; but I must say that I considered the amount on this occasion very small for so large a number of animals. These goats, however, were not so carefully treated, and not housed as are those of the Toggenburg Valley, and after having been milked were driven off to spend the night upon the mountain side.

At the time of Hook's writing (1896) the only specimens of this breed in England were in the possession of one man. There is very little in print about them, but that little seems to indicate that their hardiness is their only feature that would recommend them for the United States.



FIG. 4.—Schwarzwald Goat. (Copied from Hoffmann.)

The Schwarzwald goat.—This breed (fig. 4) is generally fawn colored, with a black stripe down the middle of the back, some dappled, and occasionally some white animals. The skin is soft and smooth, with short shining hair. The head is graceful. About one-fourth of the goats are horned. The eyes are gray, the ears thin, long, and placed well up. The neck is thin and slender and well set, with abundant hair about the throat. The withers are low, the chest quite broad, the shoulders rather strong and rounded, the back even, and running on an even line to the hips. The belly is very thin, and does not hang down. The hips are long and somewhat sloping. The hind legs are often somewhat bandy; the position of the forelegs is normal. The udder is, in the greater number of cases, large, pliant, and thinly covered with hair, and is placed well back between the hind legs; the teats are somewhat large.

The animals are bred in the region of Neckar and Donau, southwestern Germany. The occupation of goat breeding is divided among the laborers, factory hands, poor people, and also the middle class; the people possess, on an average, two animals apiece, the highest number being seven. Stables, with pasture, are rented out from September till November. The city of Tuttelingen, for two years past, has conceded a permanent pasture to the goat owners.

On plate 7 (fig. 3) is shown a picture of one of two goats which William J. Cohill obtained from Carl Hagenback, at St. Louis, and this writer is of the opinion that these goats are of the Schwarzwald breed. The description, which is from a German author, and a comparison of the illustrations, with the further aid of a personal inspection of the specimens in Mr. Cohill's possession, lead easily to this conclusion.

The Langensalzaer goat.—The district in Germany where this goat is bred is the Northern Thuringia, the upper section of Unstrut, between Heinrich and Hainleite, including the district of Langensalza, the western part of the district of Weissenensee, the southern part of Muhlhausen, and the northern part of the Duchy Gotha. The altitude of this section is from 450 to 1,000 feet. Löbe says this breed is especially suitable for level tracts of land.

This breed (pl. 11, figs. 1 and 2) is of various colors—brown, black, and white, or a mixture of these. In the Langensalzaer district the prevailing color is white. This goat is hornless, according to Dettweiler. There appears to be no uniform type, but three classes may be distinguished: (1) The common goat, almost identical with the common goat of Thuringia, and having no purity of blood; (2) a goat improved by breeding and selection, found in the neighborhood of Langensalza; (3) a goat improved by crossing with Saanen bucks.

The third class is preferred, and it predominates; and it is the one usually in mind when the Langensalzaer goat is referred to. In its improvement it has much of the appearance of the Saanen breed.

Petersen's description of the Langensalzaer goat is in the main as follows: It differs from the Saanen goat in its more refined frame, shorter limbs, and long barrel. The coat of hair is generally short and smooth, rarely long; the forehead almost square; eyes large and intelligent; ears erect and pointing forward; neck long and slender but somewhat heavier at base than elsewhere; withers well rounded; back straight; hips dropping; chest narrow, but deep and extending far back; belly round, but not hanging, and showing deep "hunger hollows;" loin not very deep; hind legs inclined to be cow-hocked (occasionally there are cases of stiff legs). The bones are fine, and the pastern short. The udder is broad and deep, similar to that of the cow, almost globular, and not in two lobes, as in other Swiss breeds; teats

long and hanging forward of the legs, nearly reaching to the ground in old goats. Oftentimes two rudimentary teats are present and yield milk.

This goat is a good milker. The annual milk yield is often large—in individual cases having been known to reach 1,800 liters. (Dettweiler.)

The Starkenburg goat.—This breed is referred to in the German literature as a noble animal. It is the result of a large infusion of Saanen blood, and is oftentimes mistakenly called the Saanen. It is raised in Pfungstaa, Heppenheim, and vicinity.

The Guggisberger goat.—This breed, sometimes called the Schwartzenburg-Guggisberger (pl. 12, fig. 2), was originally from the Simmen Valley of Switzerland. It is brown, spotted like the chamois, commonly has horns, and is considered very excellent for milk. Of recent years it has been extensively crossed with the Saanen goats. Hilpert describes it as being built like the Saanen goat, of fawn color, or brownish white, and of astonishing size. He says it is excelled by no other breed of goats in milk production when under good care and feed. The Guggisberger is well proportioned, and the accompanying illustration shows that this breed has the points of a good milker. It is also said to be a near relative of the Oberhaslian goat.

The Gassenay goat.—The Gassenay goat is of Canton Berne, Switzerland. It is pure white, like the Saanen and Appenzeller. Anderegg, a Swiss authority on the goats of that country, speaks in very high terms of this breed. Hook says that a few specimens have been imported into England, but unfortunately have not been kept pure. Gassenay appears to be another name for the city of Saanen, and it is not unlikely that the goats bearing these names are the same breed.

The Harz Mountain goat.—This breed is the product of the Harz Valley and others connecting with it, all of which are from 1,000 to 2,000 feet above sea level. Here the soil is calcareous and the water comes pure from springs. The climate is rather rigid. The animal is astonishingly large and has a strong bodily development.

The color varies from whitish gray to reddish, with a dark streak along the back; sometimes it is black or brown, or a mixture of these colors. The hide is quite thick, a condition due to the severe climate. The hair is of medium length, seldom short and smooth; the head short and broad; eyes gray; ears long and narrow, yet many have lop ears or so-called mouse ears; horns absent in most cases; neck medium long, withers strong, back straight, loins and chest broad, belly deep, thighs rather full; the legs are generally straight, but in exceptional cases cow-hocked.

The udder is well developed, bilobed as a rule, with large teats hanging between or a little back of the hind legs. When fresh the milk production is from 2 to 4 liters a day, increasing in good animals to 5 liters, and the amount for the entire period of lactation, which is about three hundred and twenty days, is from 500 to 700 liters. The taste of the milk from this breed is especially good, and everywhere throughout the Harz Mountains the milk is used as an article of diet, especially for the poor and for the invalids who sojourn in that district in large numbers.

The Wiesenthal goat.—The Wiesenthaler is a hornless mountain goat with a middling long head and sparkling eyes. The hair is short and light in color. The udder is globular in form, with a good devel-



FIG. 5.—German Farm (or House) Goat. (Copied from Zürn.)

opment of teats. When the doe is fresh her yield of milk is from 2 to 5½ liters per day, the average being about 3 liters. The quantity for the whole period of lactation varies from 600 to 900 liters. Petersen (from whom these notes are made) mentions one case where 982 liters were produced from a doe that had a lactation period of three hundred and fifty days. The quality of the milk is excellent, having especially a high percentage of fat.

The Saxony goat.—This goat can hardly be regarded as a distinct breed. It has been developed by selection from the common, or farm, goats, and by the introduction of Swiss blood, principally of the Saanen breed. Doctor Kohlschmidt, an agricultural teacher at Freiburg, has

said that the Saxony goat is equal in milk productiveness to the Saanen. His opinion was based upon personal experiment; but it is said by others that the Saanen goats employed in this experiment were imported and in all probability they were very poor specimens, for nearly all German writers refer to the practice of the Swiss in selling their poorest animals, if possible, rather than their good ones and lament the fact that the German importations are of the poor kind.

However, experiments with Saxony goats which were conducted in 1895-96 in the locality of Lauenstein, Altenburg, and Geising, with 30 goats, gave the following results, which indicate that the Saxony goat is an excellent milk producer. The annual milk yield of 27 goats of various ages, based on five experiments, was found to average 725.7 liters per head. Of the 24 mature goats, 9 gave 600 to 700 liters per head, 7 gave from 700 to 800 liters, 4 gave from 800 to 900 liters, 1 gave over 900 liters, and 3 gave 1,000 liters. The highest milk yield was 1,077.5 liters and the smallest 612.3 liters per annum. The average lactation period was three hundred and thirty-two days, and the percentage of butter fat in the milk for the entire period of lactation showed a minimum of 2.74 and a maximum of 4.41, with an average of 3.43. These results show that the Saxony goat is a good milker and altogether a very desirable animal.

The Westphalian goat.—Frequent references are made in foreign literature to this breed, but Dettweiler is the only writer who gives any real information about it, and he gives but little. The quantity of milk which it gives varies. At Warstein the production is said to be but 2 liters per day for "fresh" goats, with a total annual yield (or for the whole period of lactation) of 200 liters. Other schedules are in existence, however, which show the annual yield to be from 365 to 500 liters. Dettweiler quotes the following from Mr. Petrasch, a magistrate of Hallenburg:

Average quantity of milk for fresh milkers, 3 liters daily.
Maximum quantity of milk for fresh milkers, 5 liters daily.
Minimum quantity of milk for fresh milkers, 2 liters daily.
For the entire period, 500 liters.
Duration of lactation, 330 days.

The Hinterwald goat.—The district of the Hinterwälder (or Forest goat) embraces the whole upper plateau of the Black Forest. The description of this breed is after Huber, a veterinarian of St. Blasieu. The color is white and brown, giving a gray mixture; the skin is thin, soft, elastic, and covered with short to medium-length hair; there is an absence of horns according to Huber, but Dettweiler, from whom the illustration (pl. 12, fig. 1) is copied, shows an animal with horns; fairly long face and broad forehead; jaw well developed; mouth large and broad; eyes large and clear; ears erect; neck strong with a cir-

cumference equal to its length; chest well developed, being broad, deep, and long; back generally straight; loins generally well developed; hips, dropping; legs sometimes cow-hocked. The udder in full-grown animals is well developed, firm, elastic, both halves being of uniform size, and hangs low in old animals only.

The milk yield is about 3 liters per day; it amounts to 4 liters in exceptional cases. The annual yield varies from 600 to 650 liters, testing 3.75 per cent fat.

The Hungarian goat.—There is very little information at hand regarding the Hungarian goats. Neither Pegler nor Hook mentions them, yet the following description of a single specimen was published in the proceedings of the Royal Agricultural Society, England (vol. 15, p. 664, 1879), in the words of the judges of the show at Kilburn:

The prize winner, of Hungarian breed, exhibited by Lady Burdett Coutts, was certainly the largest he-goat that has ever appeared at any show. He was devoid of horns and had a fine head, with broad chest, level back, and well-sprung ribs, without being too long in the leg. He measured 34 inches in height at the shoulder and 46 in girth.

The Alpine goat.—Descriptive writers who have visited Switzerland have seldom failed to mention incidentally "the Alpine goat," yet very little is in print about it as an animal of economic value. Peer made no little effort to learn something about this goat, and the description here given is practically in his words.

The Alpine goat may be termed the native goat of Switzerland, corresponding in name to our "common" goats and the German "farm" goats, but not corresponding in important characteristics. These goats are found throughout the whole Alpine chain. There is but little uniformity among them, and therefore they can hardly be classed as a distinctive breed. They resemble grade animals of nearly every description. In one section certain markings may prevail and in another they are quite different. They have horns generally and are a hardy, serviceable animal.

The want of attention to certain uniform characteristics disqualifies them for breeding purposes among those who wish to follow a certain standard or type of breeding. In some districts in the Swiss Alps and also the French Alps some attempt has been made to breed to a certain form and color, but as a rule they are better classified as "all sorts." In France and Switzerland there are a few distinct families like the Saanen and Toggenburg; all the rest, except foreign goats of a distinct breed, seem to be lumped off as "Alpine goats." In some parts, however, local names are given to these goats. Some of these animals are exceedingly beautiful.

The Tarentaise goats from the French Alps, which are usually seen at the French agricultural exhibition at Paris in the beginning of

March, are very striking. They will be found described below under the heading "The Tarentaise goat."

There is another Alpine goat that is believed to have some local name. It is of a solid mulberry or mahogany red. These goats have a very short, shiny coat of hair, which sets off their graceful forms to perfection. They have very beautiful, clean heads, and altogether are, as described by Peer, the most breedy looking goats he has ever seen.

If these animals could be relied upon to breed true they would certainly be most valuable animals in the hands of any breeder who admires quality and beauty. There were quite a number of these so-called Swiss and French Alpine goats on exhibition at Paris last year, together with several other Swiss and foreign breeds, such as the Toggenburgers, Saanen, Nubians, Maltese, etc., which were said to be mostly from the zoological gardens of Paris. They created as much if not more interest than any of the other animals of the great exhibition.

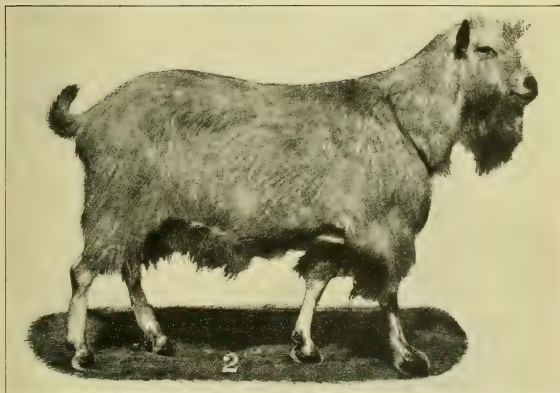
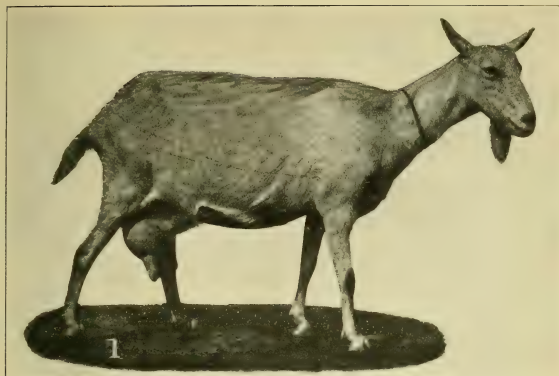
All of the Alpine goats, whether of the Swiss or French Alps, are good and useful animals. They are of early maturity, hardy, and give a good quantity of milk. Peer says they give from 4 to 5 quarts a day and that the best ones are said to give as much as 6 quarts a day.

There are over half a million goats in little Switzerland, a territory less than one-third the size of the State of New York. There are among this great number only about 3,000 or 4,000 pure Toggenburgers and 2,000 to 3,000 Saanen; probably 10,000 would cover all the distinct breeds; the balance (490,000) are natives, grades, and what are generally called Alpine goats.

The Tarentaise goat.—The Tarentaise goat is not considered a distinct breed, but is one of the several varieties of Alpine goats; and under the head "The Alpine goat," Peer describes it as a very striking animal. Its head and neck are saffron red and the body shiny black, with a black bar down each side of the face. It has sufficient merit to warrant its exhibition at the agricultural show at Paris, and is said to be a good milker.

The home of this variety is the Department of Savoie, in the French Alps.

The Pyrenean goat.—This goat, as its name signifies, is native of the Pyrenees Mountains. It has long hair, long, pendulous ears, and large horns. It is the tallest of all domestic breeds, except possibly the Nubian. Several heads have been introduced at different times into England and the crosses obtained from them have proved to be good animals. Pegler mentions some that were at the dairy show of 1884 "far exceeding in proportions anything yet produced in the way of goat breeding." This goat is a very good milker. Reports are



LANGENSALZAER GOATS.

Photographs copied from Dettweiler.



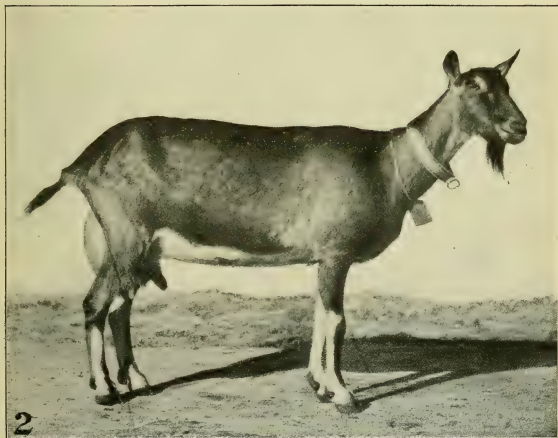
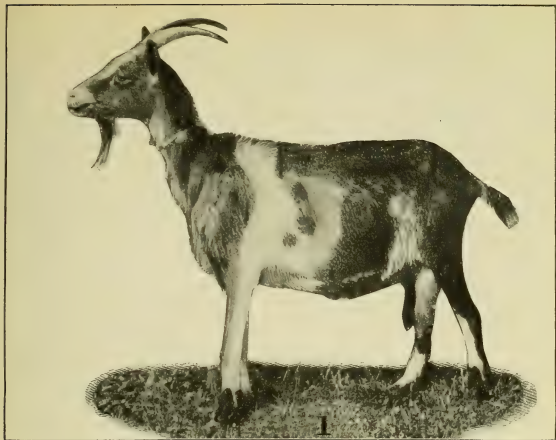
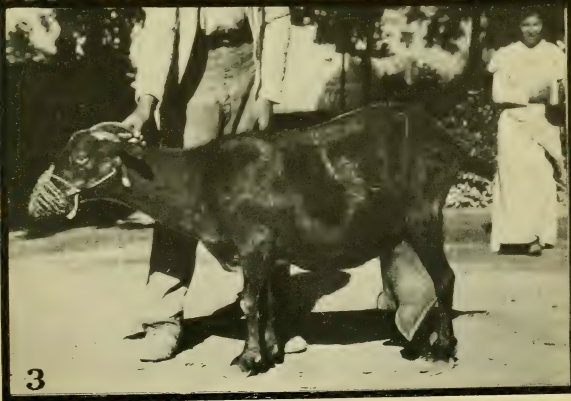
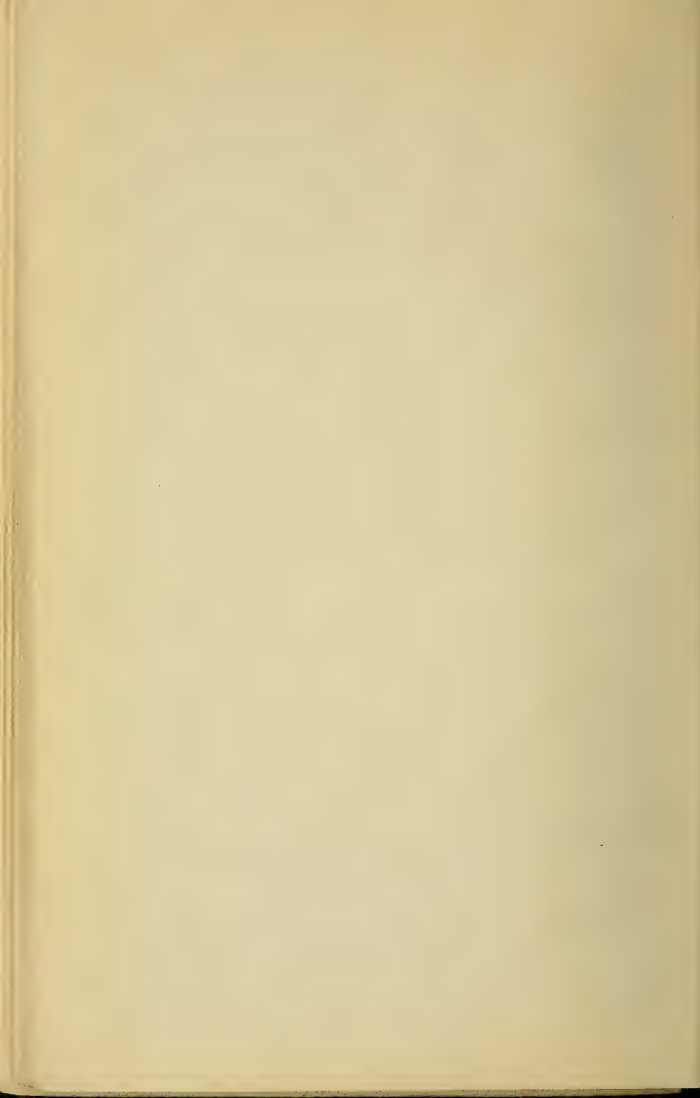


FIG. 1.—HINTERWÄLDER DOE. FIG. 2.—SCHWARZENBURG-GUGGISBERGER DOE.

Illustrations copied from Dettweiler and Hilpert.



SPANISH MILCH GOATS.
Photographs by David G. Fairchild.



published of large herds of this breed in the Pyrenees Mountains, where they are kept for the twofold purpose of cheese making and the production of skins for fine gloves. So far as known there are none of them in the United States, but they would probably thrive well in any of our mountainous sections.

The Spanish goats.—The term Spanish goat does not here mean a particular breed, for there are several varieties in Spain. Löbe refers to a "hornless Spanish goat," which is especially distinguished by its long silky hair. The illustrations which are shown on plate 13 are evidently quite a different variety from the one described by Löbe. These pictures are of the goats of Malaga and Granada, and were taken by David G. Fairchild, agricultural explorer of this Department. No records are available of the quantity of milk that the goats of Spain will give, but the size of the udder of those shown here indicates that it is considerable. It is said that all varieties of the Spanish goats are good milkers.

The English goat.—The English breeders began many years ago to produce from their nondescript stock a distinctive English goat. The lines of breeding which they pursued were the same as those proposed for the production of the American milch goat. The English have succeeded to a large degree, presaging the fact that the United States, with its more favorable climatic and soil conditions, ought to do much better in a shorter period of time.

England's climate is not suited to any of the imported breeds of goats, and her native goats were far from being satisfactory as milk producers. In order that there might be a goat that would withstand the damp climate and lowlands and at the same time produce a satisfactory quantity of milk, the English proceeded to import bucks of the Swiss and Nubian breeds for crossing upon the native does. By this method they have retained the hardiness of the native goat to a remarkable degree and at the same time acquired much of the milk-producing qualities of the Swiss and Nubians.

The following description of the English goat is from Pegler:

I have been at some pains to ascertain the points of the original breed; and from the descriptions in old works in which goats are mentioned, and a comparison with the features most prevalent at the present time, I believe the following description to be correct: Head neat and tapering, with moderate beard; frontal bone prominent, horns set far apart, rising slightly at first with an inclination to the rear, and then bending outward; ears rather large, but not actually erect nor yet pendulous, but more approaching a horizontal position, pointing forward. Body long and square shaped, with the coat short, but not so close as in the Nubian and some Indian varieties. In the male it is much longer, particularly at the neck, chest, and thighs, where it is very thick and stiff. A fine, soft, wooly undergrowth is nearly always observable between the hair. The color ranges from black to white, but is more often light or dark fawn, with a darker line along the back and black on the legs.

In a personal letter to this writer, Hook believes it would be wise for the people of the United States to secure some English goats to breed up the common stock here. It can hardly be doubted that the result of such a procedure would be very beneficial, for the English goat is really a good animal.

The Irish goat.—This goat is mentioned and described in order to forestall any desire to import the blood for American use. The following is from Pegler:

The hair is long and shaggy, generally a reddish black and white, or yellowish gray and white. The head, instead of being short and tapering, is long and ugly, the muzzle being coarse and heavy, with a considerable amount of beard even in the females. The horns are large and pointed, situated close to each other, and rising almost perpendicularly while inclining to the rear. Those of the male are very large, and attain sometimes an immense length, a pair in my possession measuring each 30 inches. Besides the increase in size, they open out more than those of the female. The size and shape of the horns render both male and female formidable antagonists when pugnaciously inclined, which they not unfrequently are, both to each other and to persons who are strangers to them, so that they are not altogether safe with children. The Irish goat is a rather taller animal than the English, but its gaunt, flat-sided appearance renders it anything but prepossessing. It is nevertheless a good milker, though the yield is comparatively poor in quality. The udder is generally long and narrow, with big teats.

Pegler does not say much for the Irish goat, but Hook, in the following, says less:

Of small size, with long shaggy coat and large horns, it has little but its low price to recommend it. Rare examples may be found to yield a large quantity of milk, but only for a few months after kidding; and, as it is impossible to induce these animals to breed, except as their half-wild nature prompts, the production of milk in winter is entirely out of their power.

The Welsh goat.—It is believed that in a former time there was a distinctive breed of goats in Wales and also in Ireland, but the Irish blood appears to have dominated and overrun both countries. It is believed that originally the Welsh goat was large, white in most cases, and of a kindly disposition; but this is not the case at this time. Pegler says of it:

In many points it resembles the Irish goat, but is smaller and more symmetrically shaped, the head and horns being more graceful and the body lighter. This breed is not of much value for milk. The udder and teats are usually small, and it does not remain any length of time in profit.

The Nubian, or Abyssinian, goat.—This breed (fig. 6) is the most peculiar of all goats, and in many respects differs so much from other goats that at a distance it may be mistaken for some other animal—at least not be taken for a goat.

It is a native of Nubia, Upper Egypt, and Abyssinia. With slight modifications, it may be found in other parts of the African continent as far south as the Cape of Good Hope.

Its size is extraordinary, being fully a half larger than ordinary goats, and it has very long legs. In a pronounced degree this goat

has the rounded forehead and nose that are so characteristic of all African sheep, but why this similarity exists no one ventures to say. Below the top of its head the forehead rises so as to form a conical prominence, then sinks toward the nose until the nostrils are in an actual depression. The lower jaw protrudes beyond the upper, and the teeth often extend above the nostrils. The ears may be flat, long, large, and pendant, or very short, straight, and pointed.

The Nubian is considered a hornless breed, and it is probably as nearly hornless as any breed, yet it frequently occurs that the bucks develop horns, which are flat and short, and which lie upon the back of the head. The horns at a distance midway of the length curve outward. There is an entire absence of beard, and the "goat odor" so common in the males of other breeds is entirely wanting in this one, not even appearing at rutting time. The eyes are large and lie flat in the head. The color is glossy black or dark brown. Several authors



FIG. 6.—Nubian Goat. (Copied from Hoffmann.)

who are familiar with this breed assert that the hair is always short, while one, who is no doubt equally as well informed as the others, says the hair is long. The fact is that there are both kinds. Pegler describes it thus: "The hair is comparatively short in the male, but very much so in the female," yet he gives an illustration of a Nubian with long hair. It can hardly be doubted that the Nubian is closely related to some of the other breeds of northern Africa, all of which have long-haired strains among them. The skin is oftentimes much wrinkled.

The udder is deeply indented, or divided, so as to form very distinct lobes. The teats are situated, as in all species, on the lower part of the udder, but upon the outside.

The Nubian is the most peaceful and gentle of the goat family. It is not vagrant, and does not require delicate nourishment. The only objection that can be ascribed to it is such extreme sensitiveness to

cold that it can with difficulty withstand the slightest degree. For this reason, in France and England, it is always provided with a warm house during winter, and never turned out in the morning when there is frost. It is said that the slightest cold produces abortion almost instantly.

Crosses have been made of Nubian bucks upon selected common does with results very satisfactory. The crosses have better developed forms than the common goats; they are more robust, and partake largely of the physical characteristics of their dams. It is a pleasure to quote here from a letter by Wm. G. de Coligny, of Springfield, Mass., who had experience with Nubian goats in Ecuador:

Mr. Francisco Chiriboga, now deceased, a large cattle raiser in the province of Imbabura, northern Ecuador, had a flock of about twenty Angoras and one of Nubian goats, ten in number, which he imported from France, from the Government station at Souliac, department of Cantal. He used to cross them for the wool, milk, and meat. The Angora became fairly good milch goats, but not so good as the crosses from the Nubian upon the common goat. * * * The hair of the Angora-Nubian goats was not white, but very silky, fine, steeple pointed, and about 8 inches long; in some individuals 10 inches long.

The amount of milk produced from three or four Nubian goats and their crosses at that time (1877) was about 4 liters per head per day. Milk from the Angora-Nubians was about $2\frac{1}{2}$ liters per head per day, and from the Nubian and common goat cross, about $3\frac{1}{2}$ liters.

Of all domestic animals, except the rabbit and the hog, in the language of Du Plessis, the Nubian goat is the one which increases most rapidly. A French writer (Sacc) says that he has known one of these animals to drop eleven kids in one year, four on two occasions and three at another. This, of course, is an unusual case, yet it can be safely affirmed that Nubian goats generally have kids twice a year, and frequently there are triplets.

Sacc avers that the daily yield of milk per animal is from 10 to 12 quarts, and that it seldom falls below 4 quarts; and that the milk is universally pronounced excellent and of a higher fatty content than milk from native goats. Du Plessis thinks Sacc has exaggerated by regarding the exception rather than the rule. It is nevertheless true that the Nubian goat is the highest type of milch goats. Du Plessis regards a good yield for the Nubian is from 5 to 6 quarts per day. He conducted some milking experiments for five days with two goats—one a pure Nubian and the other a crossbred Nubian and native goat. The results obtained are given on the following page.

Production of milk by a Nubian and Nubian cross.

Day.	Nubian.		Nubian cross.	
	Quantity of milk.	Quantity of cream. ^a	Quantity of milk.	Quantity of cream. ^b
	Quarts.	Quarts.	Quarts.	Quarts.
First	4.6358	0.4012	4.7699	0.2223
Second.....	4.6569	.4063	3.6115	.2217
Third	4.7836	.4065	3.5376	.2212
Fourth.....	4.9315	.4191	3.8966	.2428
Fifth.....	5.2166	.4255	3.8966	.2534
Total.....	24.2444	2.0586	19.6383	1.1614
Average per day.....	4.8448	.4117	3.9276	.2322

^a Butter, 8.41 per cent.

^b Butter, 5.91 per cent.

Given a suitable climate, proper feed, and intelligent handling, this breed will excel all others in milk production. So far as the United States is concerned, however, its area of usefulness in its pure state will be limited, it seems, to the extreme Southern States and southern California. This is the opinion of De Coligny, who is familiar with this breed. However, among goats imported into Canada within the past two years there is said to be a Nubian buck that is withstanding the cold climate of that locality. The tenderest care must be his lot if he is a pure specimen. The writer has been unable to obtain any information about this animal by correspondence, or indeed, about other breeds of the same importation. A few Nubians may be found in England, where their value has come to be recognized for crossing upon the common goats of that country.

The Egyptian, or Nile, goat.—The description given of the Egyptian goat (*Capra aegyptica*) is after Hoffmann. This goat has a small head and either short horns or none at all. It has a facial expression that is remarkable and peculiar. The nose is short and stumpy, the nasal bone bulging upward. The lower jaw is longer than the upper one. The beard is often wanting. The eyes are small; ears about as long as the head, are narrow and rounded at the end, and are pendulous. The color of the hair varies from reddish brown to light yellow, and always lighter in color on the belly than elsewhere. The goat odor is never present. (Note the similarity of this goat with the Nubian, the Syrian, the Mamber, and the Zarahbi.)

The Egyptian goats are numerous in the Nile Valley as far as Nubia and Upper Egypt. They are regarded as among the best milch goats, and are said to give daily from 5 to 6 quarts of milk. Hoffmann says it has been claimed for this breed that a specimen has been known to give from 10 to 12 quarts of milk daily.

The African, or Widah, goat.—Löbe says the African goat in its conformation and peculiarities resembles the Angora, but is smaller. The short description given here of this goat is translated from the German of Hoffmann:

This goat is the most handsome and graceful of all goat breeds. It is of medium size and has a shapely head; has a robust, well-rounded, fleshy body, and better developed legs than any other breed of goats. The horns are thin and curve gently backward and outward, the point bending back again so as to form the beginning of a spiral. The hair is short and coarse; on the neck, back, sides, and legs it is black, but underneath it is yellow. The color may be reddish or yellow.

There is a subbreed of the African goat called the Dwarf goat (fig. 7). It is only 13 inches high and 26 inches long, according to Löbe, who makes no comment as to its value.

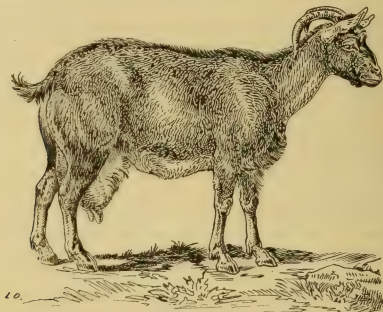


FIG. 7.—African Dwarf Goat. (Copied from Hoffmann.)

The Zaraïbi goat.—The illustration (pl. 14, fig. 3) shows a prize-winning Zaraïbi buck at one of the shows of the Khedivial Agricultural Society of Egypt. Nearly all travelers through Egypt who observe the live stock there mention this goat as a most excellent milker, and it always appears at the shows, yet no description of it is at hand. It is a large animal with long hair and especially characterized by its very long ears. The description of the Egyptian goat applies to the Zaraïbi pretty well, but the writer has been told by visitors to Egypt that the former, although a good animal, is not the equal of the latter, and also that the former are much more numerous. There is good evidence that this breed was originally from Syria.

The following report regarding this breed is from David G. Fairchild, agricultural explorer of the United States Department of Agriculture:

The Zaraïbi is the best milch goat known in Egypt and it is used largely by European families desiring pure milk for their infants. It not only gives more milk than

the ordinary kind, but is said to be a better breeder. I learned that the wealthiest landowner in Egypt had only recently purchased several for his own use. The best herd in Egypt is owned by the Khedive.

Mr. Fairchild was permitted to inspect the Khedive's herd of goats, a privilege seldom accorded to anyone. He believes they could with advantage be introduced into southern California in the warmer parts, but does not think they would live through the cold winters of the North unless housed very carefully. The climate to which they are accustomed is very much like that of southern California.

G. P. Foaden, secretary of the Khedivial Agricultural Society, forwards the following statement:

The Zaráibi goats are a race which was brought originally from Syria. They are superior to the native breed. They are now bred chiefly in the neighborhood of Cairo. A good average goat will give 4 pounds [quarts?] of milk per day and costs when full grown, if well bred, as much as £1.10 (about \$7).

The Syrian goat.—The writer is unable to find an authoritative description of the Syrian goat, but the evidence given by travelers in that country is convincing that, all things taken into consideration, this breed must take a place among the best breeds for milk production. It is always long haired and in color mixed black and white or solid black. Its ears are very long and pendulous, making it easy to believe that it is the original stock of the Zaráibi breed found in considerable numbers in the neighborhood of Cairo. The only available photograph (pl. 15, fig. 1) of this breed is the one given herewith, being one taken in Nazareth in April, 1904, by Mrs. Sallie Russell Reeves, of the United States Department of Agriculture. The flock shown here is owned by the German Orphanage and constitutes the only source of milk for that institution.

Dr. Ira Harris, who has been the American consular agent at Tripoli, Syria, for upwards of twenty years, has given the writer some interesting and valuable information regarding the Syrian goats, and some of the important parts are embodied in what follows:

This goat gives about 16 pints of milk a day, and the lactation period is usually nine months. It is a hardy breed, being kept all over Syria—on the plain, and on the mountain, where there is snow and frosty weather. "On the Hameth and Hums plain," says Doctor Harris, "they have a hot summer and a cold winter. I know of no other animal that has such a strong constitution unless it is a donkey." These goats are often seen in large flocks in Syria. Doctor Harris states that he has seen 2,000 kids in one flock.

It is likely that this breed could be easily acclimatized in the United States, and the low prices at which they can be purchased in Syria would seem to make it desirable for some one to consider the feasibility of importing some of them.

The Mamber goat.—The Mamber goat (*Capra mamberica*) is, according to Hoffmann, similar in many respects to the Cashmere [Angora?], but the horns, when they are present, are smaller. The ears are about three and one-half times as long as the head, are broad, thin, with the end rounded and turned up. The home of this breed is Asia Minor, especially in the vicinity of Aleppo and Damascus.

Hoffmann's description gives the impression that the Mamber goat is variously colored. The usual color is most likely black or brown, as it is probably closely related to the Egyptian and the Nubian goats.

The Sumatra goat.—The little that the writer has been enabled to obtain concerning the goats of the island of Sumatra is taken from Hook, who mentions them as scarcely larger than cats, and Hook says that, when contrasted with the large Pyrenean, the relation is much like that between the bantam and Cochin China fowls. It is hardly likely that there will be any desire to employ any of the Sumatra blood in building up a milch goat industry in the United States.

The Spanish-Maltese goat.—Under present conditions this goat would better be considered as among the American milch goats; but as they were bred as Spanish-Maltese several years before the other name was suggested, they will be treated separately here. (Pl. 4, fig. 3.)

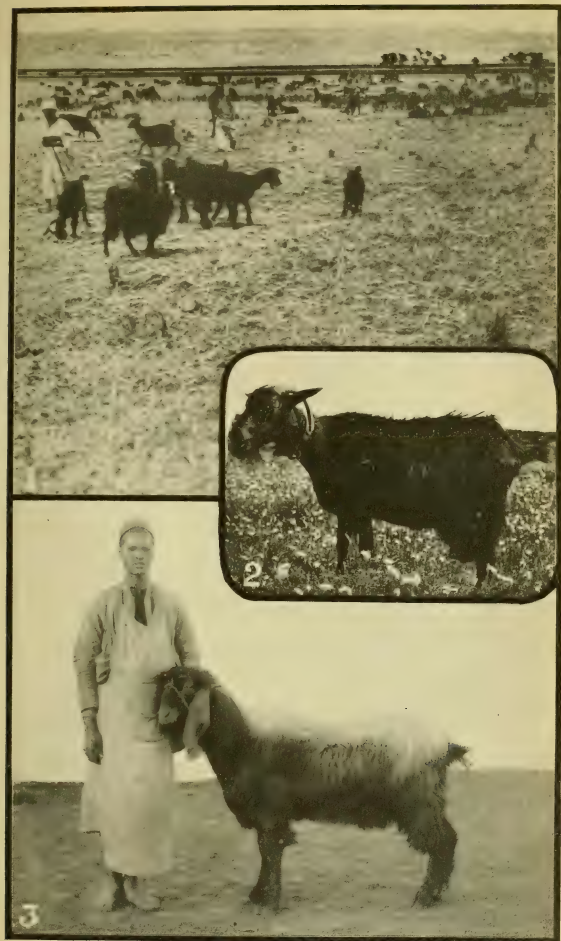
It is known that Spain at a former time received many goats from Malta, and it is claimed that some of these found their way to Mexico, and finally to Texas and New Mexico. Their history is difficult to trace accurately, however.

The following description of these goats is by B. H. Van Raub, of Texas:

The Spanish-Maltese goat is about the average size of the common or the Angora goat, possibly a little larger. It is white or grayish in color, but many have brown, bluish black, or reddish spots. Many have coarse hair, some have long, fine, silken hair, and some have short, coarse hair. As a rule they have pendulous ears. There are more hornless, or muley, goats among the Spanish-Maltese than among any other breeds.

It may be true that this particular strain is less inclined to produce horns than the common American goats, but it is not the case when considered in connection with the best breeds of Europe and Egypt.

There is no information available as to the quantity of milk that these goats will yield, although 2 quarts a day for some individuals has been estimated.



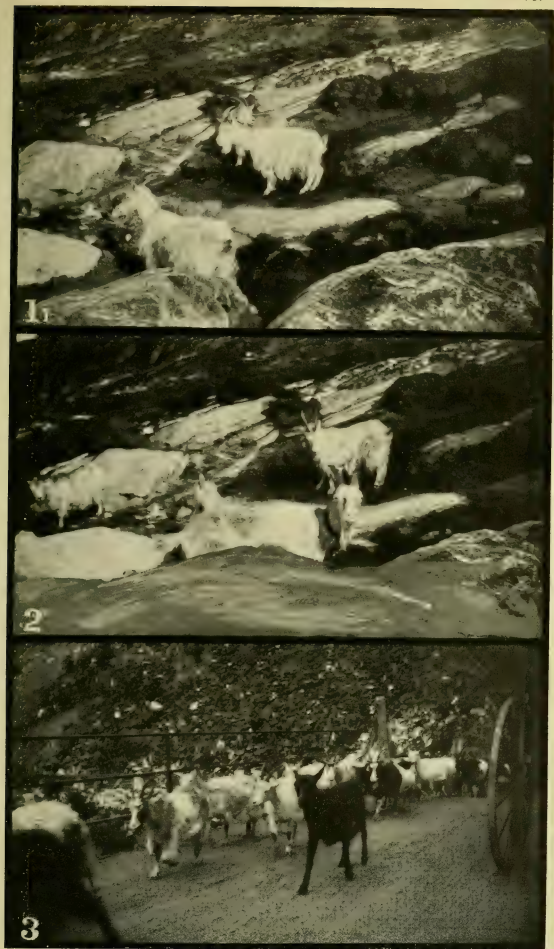
FIGS. 1, 2.—COMMON GOATS OF EGYPT. FIG. 3.—ZARAÏBI GOAT.

Photograph of figs. 1 and 2 by David G. Fairchild.



FIG 1.—SYRIAN GOATS AT NAZARETH. FIGS. 2, 3.—GOATS AT ATHENS.

Photographs by Sallie Russell Reeves.



FIGS. 1, 2.—GOATS NEAR HAMMERFEST, NORWAY. FIG. 3.—GOATS IN SOUTHERN NORWAY.

Photographs by Miss Caroline Myers.

THE MILCH GOATS OF SWITZERLAND.

By FRANK SHERMAN PEER,
Cornell Heights, Ithaca, N. Y.

In the spring of 1904, I had the pleasure of visiting Switzerland in the interest of several American gentlemen who wished to buy and import to this country some of the noted cattle and milch goats of that country. Armed with letters of introduction to the Swiss minister of agriculture, I arrived at Berne one day in March, full of delight at the magnificent scenery and anticipation of the work before me. The Swiss minister of agriculture sent me to the American consul as being the proper person to bring the questions before his department. The result was a letter to the president of the Swiss Agricultural Society, who in turn gave me letters to the best and most reliable breeders of milch goats in Switzerland.

It was soon learned that there were several breeds of goats in Switzerland, but that the best milking breeds were the Toggenburg, the Saanen, the Alpine, and the Schwarzthal,^a and of these the Toggenburg and Saanen goats were the best milkers. Therefore I confined my attention principally to the last two varieties.

All the breeds which I investigated are about the same size and weight, except the Saanen, which are about 25 to 30 per cent larger and heavier than the others. As to a choice between the Toggenburg and the Saanen, I like the Toggenburg better for a close-at-hand inspection and the Saanen best when seen in the field. There can be no prettier sight than a flock of Saanen goats on a hillside or in a green pasture.

In 1903, there were exported from Switzerland 50,000 francs' (about \$10,000) worth of Toggenburg goats, which speaks well for their popularity in foreign parts. Animals winning a prize are not allowed to leave the country or the neighborhood where raised for a year.

As to the quality of Toggenburg and Saanen goat's milk, so far as I could judge, there was no choice. They both give nice white milk, quite free from a goatly taste, which can not be said of all goats. It is seldom yellow and is probably the better for it. The best goat's milk, as I understand, is that which shows the greatest proportion of casein. Goat's milk in Switzerland is rarely made into butter.

^a Mr. Peer's descriptions of these several breeds are embodied in the text dealing with the breeds.—EDITOR.

The milk is considered good after the third milking, and the quantity rapidly increases for a few days after giving birth, when the maximum is reached. It usually continues for five or six months and sometimes for seven and eight months, when it gradually declines. A good goat may be expected to give 600 to 700 kilograms a year. The French feeding tests have proven that seven goats may be kept on the feed necessary for one cow, and that the seven goats will give much more milk than one cow.

GENERAL TREATMENT, FEED, AND CARE OF THE GOATS.

The goat of Switzerland is the Swiss peasant's cow, the Swiss baby's foster mother, a blessing to sanitariums for invalids, and a godsend to the poor.

Switzerland is a country of narrow valleys and lofty mountains. The winters in most parts are long and severe. The valleys are devoted to hay and grain to support the farm stock through the winter, while the foothills and mountains are the pasture ground during the summer months.

The highest mountains are covered with perpetual snow. Winter in the Saane and Toggenburg valleys sets in about November 1, and the ground from about that time until nearly May is covered with snow. When the writer visited there in March last the snow was from 3 to 6 feet deep on the level. Scattered all over the vale and on the foothills are little barns filled with hay, and this is either brought on hand sleds to some stable near the house, which, as a rule, is a part of the house, or the stock are moved from one barn to another, in turn, as the feed gives out. There are no large herds of goats owned by a single man or company, but nearly everyone has from 1 to 6. Ten or a dozen goats are considered a very large flock. The goats in winter occupy a portion of the cow barn or horse barn, or some warm stable adjoining the kitchen. As a rule, neither cattle nor goats go out of their stalls from the day they are put in in the autumn until the following spring.

The cows are usually fresh in the autumn after they come into winter quarters. Winter dairying is the universal practice. The goats drop their kids in the spring, beginning in March. About May 20, when the snow is gone from the valleys and the lower foothills, the larger herds of cattle are taken from the stalls and bells of different sizes and notes are put on their necks. One, called the "bell cow," wearing the largest bell of all, leads forth the herd to pasture. Together with this herd of cattle and goats, which belong to some larger farmer or breeder, go the cows and goats of a dozen or more neighboring peasants.

A cow man, with the "big bell" cow as leader of the flock, starts for the pasture fields; several boys go along as assistants. It is a great

day of rejoicing for cattle and goats and kids alike, after their long winter confinement. The gaily dressed cow men, the chorus of the bells, the sporting calves and skipping goats all make a very interesting spectacle indeed. These animals go yearly to certain locations on the foothills, and, as the snow gradually disappears, they keep moving the herd higher and higher up the mountains until midsummer, when they arrive at the limit of vegetation and shortly after begin the descent, and about November 1 they are all back in the stables again for the long winter.

Dotted all over these lofty mountain ranges are little huts which are the headquarters of the cow men and boys while herding in that particular vicinity. Once or twice a week someone goes to the valley to renew the larder with dried fish, canned meats, and bread.

There are scattered over these mountain ranges little creameries mostly for making cheese. The milk from the goats is mixed with that from the cows and made into cheese. In some cases, however, the calves born the autumn before are allowed to suckle their dams while in the mountains and the goat's milk with a little cow's milk only is made into cheese. There are therefore many brands of this mountain-made cheese, differing largely only in the proportion of cow's milk to goat's milk. The process of making these different kinds of cheese is generally the same.

Goats and cows seem to work well together on these summer pilgrimages above the clouds. The goats oftentimes go where cows can not, and they live largely on twigs and shrubs, which the cows do not eat.

The winter feed of the goats consists of a small wisp of hay daily and possibly a handful of oats or other mixed grains. As a rule, they do not get any more than sufficient to keep them in very ordinary condition.

As to prices, Toggenburg goats from 1 to 2 years old in March, before dropping their kids, cost \$12 to \$15 per head; bucks, \$15 to \$25. Saanen goats of the same age cost from \$3 to \$10 per head more, and Alpine goats from \$3 to \$5 less, than the Toggenburgers. The Schwarzthal, or Glacier, goats cost from \$15 to \$20 for females and from \$20 to \$40 for males. Cheaper grades of goats, such as are usually exported through local dealers, may be had, but they are usually the culls.

Treatment of kids.—As a rule, the goats of Switzerland are allowed to breed only once a year, but where it is desirable to obtain the greatest yield of milk and the most increase, they may bring forth their young three times in two years. By this system the yield of milk is increased to an average of 1,000 kilograms (2,200 pounds) per year. The kids are usually allowed to suckle their dams for a day or two, the first milk being very necessary to the healthful movement of

the young kid's bowels. Twins are the rule, and sometimes triplets, and occasionally four kids are dropped at a birth. The best breeders prefer that the females be 2 years old when they drop their first kids; but they will breed younger.

When a young doe gives birth to twins she is generally assisted in rearing them by a nursing bottle and cow's milk, which is diluted nearly half with water and slightly sweetened. Usually, with a number of fresh milch goats on hand, the kids are separated from the dam (in fact, they are rarely ever allowed to run with their dams) and are taken one at a time and put upon another doe, so as to divide the quantity of goat's milk in accordance with their wants or age. When cheese making is the object, it is planned to have a fresh cow to bring up the kids, as above described, beginning always with goat's milk and reducing the quantity and increasing cow's milk and water as the age of the kid will permit.

Feed.—This milk feeding goes on for five or six weeks, when most of the kids are weaned from milk altogether. They are given a small quantity of hay to pick at when a few days old. The best breeders in Switzerland say that buckwheat flour, corn (maize), and a little warm water make the best grain ration for milch goats. Oats, ground and whole, are also fed.

SWISS MILCH GOATS IN AMERICA.

There are many reasons why the milch goats of Switzerland should find a welcome in the United States. First, their milk is the nearest to that of human mothers, or, at least, is such that the most delicate stomach can retain it. It can generally be taken freely where cow's milk would not be tolerated. In connection with sanitariums and for use in all acute stomach troubles, these goats fill a want that can not be estimated by dollars and cents. In this way probably they will find a footing in this country. They are the poor man's cow, as has been said before, and thousands of laboring men would find them a luxury for their homes and a godsend to their families.

The trouble will be that in this country the goat has so long been an object of ridicule among those who never understood its value that a false impression has sprung up among laboring men that is prejudicial to the keeping of goats. There are thousands of homes, especially in the mining districts, where herds of goats could be driven away in the morning and returned at night; and they would supply the homes with a most nutritious and most healthful beverage and food at a trifling cost.

Points.—In selecting any kind of milch goats there are some general rules that may govern. One of the most common faults is an inclination of the hocks, which causes the hind feet to turn, or toe, out.

Quality or fineness of hair is usually demanded; also thickness of coat. Another fault which is noticed among animals (on account of in-and-in breeding or neglect) is a dropping away behind the shoulders. Goats should have deep, full breasts, strong loins, broad backs, deep bodies, and large stomachs; these are the general requirements. Then comes color markings, and all that goes to constitute family type in each particular breed.

When we realize the wretched stabling and scanty feeding in Switzerland, it may confidently be expected that the goats will be greatly improved in every respect by good care, proper ventilation, and by liberal feeding. By such rational treatment they should be brought to a much higher state of perfection as milk producers.

Soil.—Neither a goat nor a sheep will thrive on soil that is at all damp unless thoroughly drained. While goats are said to live on anything or nothing, they are even more fastidious than sheep. They require a wide range. They pick the tenderest bits of grass and buds, and when they have fed over a ground once or twice the taint from their own bodies makes the pasture objectionable to them, and they keep on feeding there only by stress of hunger. Where a wide, hilly range or frequent change can not be given, they should be tethered and not allowed more pasture to go over in a day than they will eat. In this way they may always have fresh, untainted forage within a very small inclosure, or, better still, where a wide range can not be given they may have the run of a small inclosure and be fed soiling crops in the stalls during the day. In hot weather they should have stalls darkened to exclude the flies in the daytime and the liberty of a yard, paddock, or field at night. In spring and autumn they could go out in the daytime and remain in at night.

It must be remembered that goats are very sensitive animals, and, while they are, in jest, said to live on air and snow, they are, in reality, very susceptible to sudden changes of climate, cold storms while at pasture, and drafts while stabled. While they have a great stock of vital energy, their milk supply is more easily affected by sudden change and exposure than that of either cattle or sheep. In Switzerland the goats of the best breeders are housed at night, even after they go out to pasture, until the weather is thoroughly settled, when they are fed soiling crops by day and go out by night.

Stabling.—The milch goat has already attained quite a degree of popularity in England, and, while visiting that country during late years, I have seen some very complete stables and stalls, which seem to meet all requirements. The prime object in building a goat stable is, first of all, absolute dryness; stone basements or masonry walls, unless built hollow, should be avoided; second, ventilation, or plenty of fresh air without draft.

GOATS IN NORWAY AND SWEDEN.^a

By CAROLINE HARRISON, M. S.,
Of the Bureau of Plant Industry.

According to the live stock census, the entire number of goats in Sweden in 1900 was 80,000; of these, 2,687 were exported. The law in most provinces forbids small farmers and laborers to allow goats to graze in the woods, and this has probably been the cause of the decrease from some 200,000 in 1850 to the present number. About half of the goats of Sweden are to be found in the western provinces, Delarne and Jemtland.

Norway is a primitive as well as a very poor country, and yet education takes a surprisingly high rank. All the fishermen along the coast can not only read and write, but they write articles for the current papers that need little or no editing. They all have telephones in their huts and can call help, as they often do, if a catch is too large to manage with the help at hand. All along the precipitous western coast from the capital to the North Cape—a distance, if indentations are measured, of 1,700 miles—these fisher people were found, and all appeared to keep one or more goats. The larger numbers of goats, however, are to be found inland, in the narrow valleys, particularly in Gudbrandsdalen.

While the average mountain is about 3,000 feet high, yet so common are these mountains that there is left only 3 per cent of arable land in the entire country. Wild Norway is really an ideal goat pasture; and the little ground that can be cultivated is found along the rims of the fjords that carry the sea inland sometimes more than a hundred miles. These fingers of the ocean are so deep that large steamers may go within a few feet of the mountain side. From the steamer we often saw goats, sheep, and cows very distinctly on both sides. These mountain sides are covered with a low growth of the European birch (*Betula alba* L.) and the dwarf birch (*Betula nana* L.), the foliage of which the goats eat as far as they can reach.

^aMiss Harrison and Miss Caroline Myers, of the Department of Agriculture, made a trip through Scandinavia, covering the period of April 29 to July 28, 1904. The object was scientific investigation as well as recreation. This article gives the results of only a part of the work undertaken.—EDITOR.

The farming in Norway is for the most part done by the women, while the men go to sea, fish, or engage in other occupations. There is very little exchange of products, so that a variety of goat might be found in one province and not appear again in all Norway. For those who contemplate the purchasing of stock it would seem best to visit the annual fairs which are held in Christiania, Bergen, and other cities, the exact dates of which may be obtained from our consuls. The Government distributes the prizes, which are certificates of merit. The Government also exhibits animals as models of the standards to be attained. The Emperor of Germany sends his buyers to these fairs to purchase horses, and it would seem to mean as much in the selection of goats as of horses.

The goats, as well as the cows and sheep, are taken to the mountain farms—"saeters," they are called—for the summer. In early spring the grazing is done in the valleys; about the first of June the herd is taken part way up the mountain by the saeter girls. A summer house, with all appliances for butter making and cheese making, is kept here from year to year. As the summer advances and feed grows scarce, the stock is moved up to another farm, and so on until fall, which begins in September.

In winter the goats are housed in the warmest and most carefully kept stables. For winter food potato tops, birch leaves, and many other things are cooked up into all kinds of warm teas and soups for goats and other animals. The people of Norway love their animals, and during our stay in all Norway we saw not a single animal in poor condition.

Norway has two kinds of cheese made from goat's milk—one brown, made from whey, and one white, made from the milk. The brown one looks and tastes to an American like brown soap. They are both called "gjitost." "Gammelost" (old cheese), the national cheese of Norway, ripened underground and smelling so strong that Limburger is a fragrant bouquet in comparison, is not a goat's cheese, as generally thought by travelers, but made from cow's milk.

We always had a large number of varieties of cheese at breakfast, which were served in very attractive ways—with hand-worked bands of linen or doilies, and the whole put under bell jars.

The temperature of Norway varies with the altitude and is very different on the coast from the inland. The Gulf Stream modifies the western coast to a remarkable degree. On the coast and in the southern part the mean annual temperature is 44.5° F., and at altitudes of 3,000 feet is 31° F. July is the warmest month, with a mean temperature of 61° F. In September and October the temperature falls rapidly, but it is not until November that the mean temperature of the day falls below the freezing point. December, January, and February are the coldest months. The mean winter temperature at

Christiania is 32° F., and far up the coast it is often not lower than 4° F. Inland it is much colder.

The annual rainfall is varied, being on the coast 48 inches and at many stations inland not more than 12 inches. Norway is not so cold as its latitude on the map would indicate, and the temperatures are constant. During our trip, in June, to the North Cape the thermometer kept steady between 48° and 50° F.

Hammerfest is farther north than any other town in the world, being 70° 40' 11" north latitude and 23° 45' 25" east longitude. Around Hammerfest are swamps, and just behind the town rises a small mountain to the height of 1,300 feet—about as high as Mount Lowe, in southern California. We observed the goats, which were white, about 800 feet up. The only thing seen which they might eat was the dwarf birch (*Betula nana* L.) and a willow (*Salix arctica* Pall.) not more than 2 feet high. While we were there, the 21st, 22d, and 23d of June, we could sit on the hillside and pick violets with one hand and make a snowball with the other. The sun's rays come straight down and prick like needles. The sun does not set from the 13th of May until the 29th of July, and with twenty-four hours of sunlight growth is rapid. The mouth of the Alten Fjord extends to near Hammerfest, and is reached by boat every day during the summer.

On the Stalheim road, some 4 or 5 miles from Gudvangen, we saw, besides individual goats, a herd of some 300 or 400 in the care of two young peasant girls. The road is in the Naeroedal, a valley exceedingly narrow, flanked with steep mountains of great height. This is one of the best valleys for goats in Norway.

The facilities for getting about in Norway are excellent. The roads are all owned by the Government, and are perfect. The horses and carriages are controlled by Government regulation, and the stations furnish large rooms, with excellent, clean beds. The simple food is well cooked and served in good order. The telephones and telegraphs are cheap, convenient, well managed, and everywhere available. American money, in bills not exceeding \$10, is preferred to Norwegian money, because it is wanted for emigrants. While it is always an advantage to know the language of a country, yet for all business purposes almost everyone speaks some English. Besides, the Norwegian language has a simple construction like our own, and enough to get on with is easily learned.

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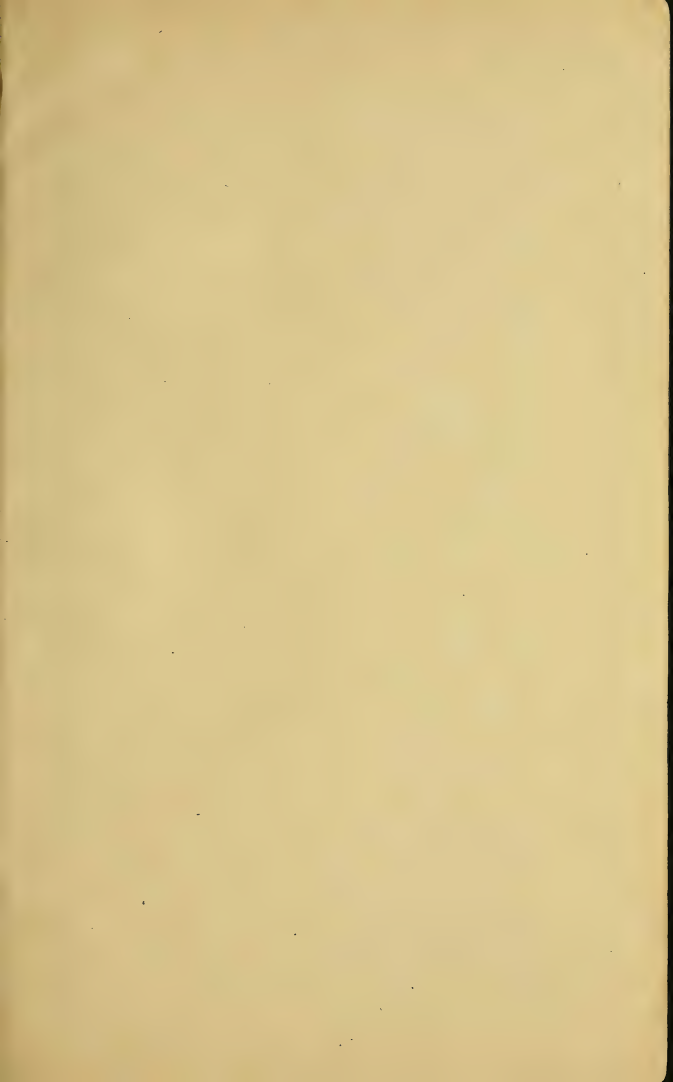
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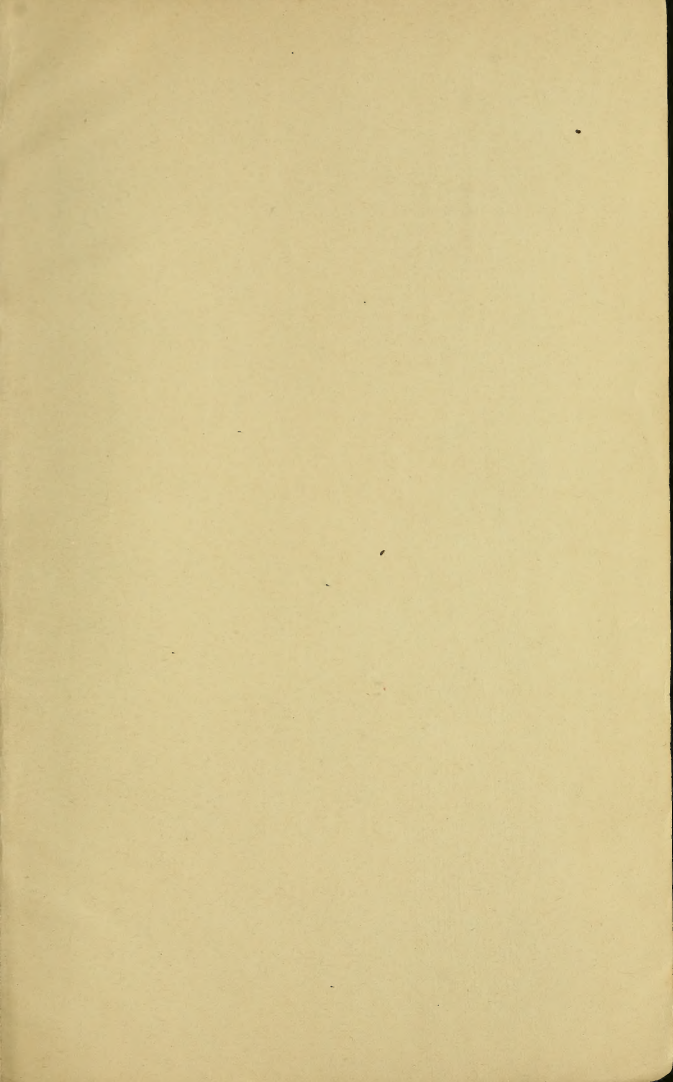
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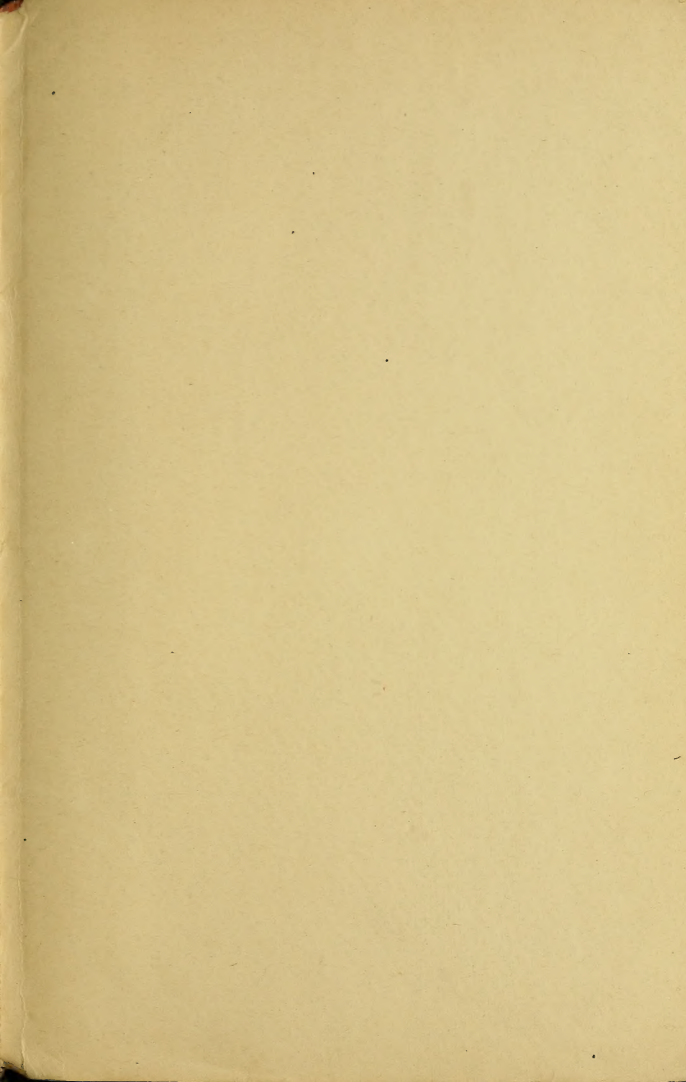
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